4 MAY 1951 ONE SHILLING

FLIGHT

and
AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

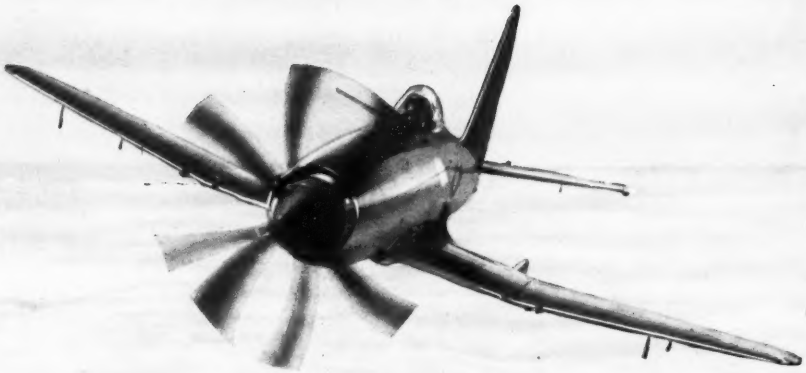
FAIREY 17

TWIN-ENGINED · ANTI-SUBMARINE · CARRIER-OPERATED
(Armstrong Siddeley "Double Mamba")

Chosen for Service in the ROYAL NAVY

THE FAIREY AVIATION COMPANY LTD., HAYES, MIDDLESEX

The Westland Wyvern



is fitted for all
electrical services
with

B.I. Callender's **AIRCRAFT CABLES**

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

PERCIVAL P56

R.A.F. BASIC TRAINER

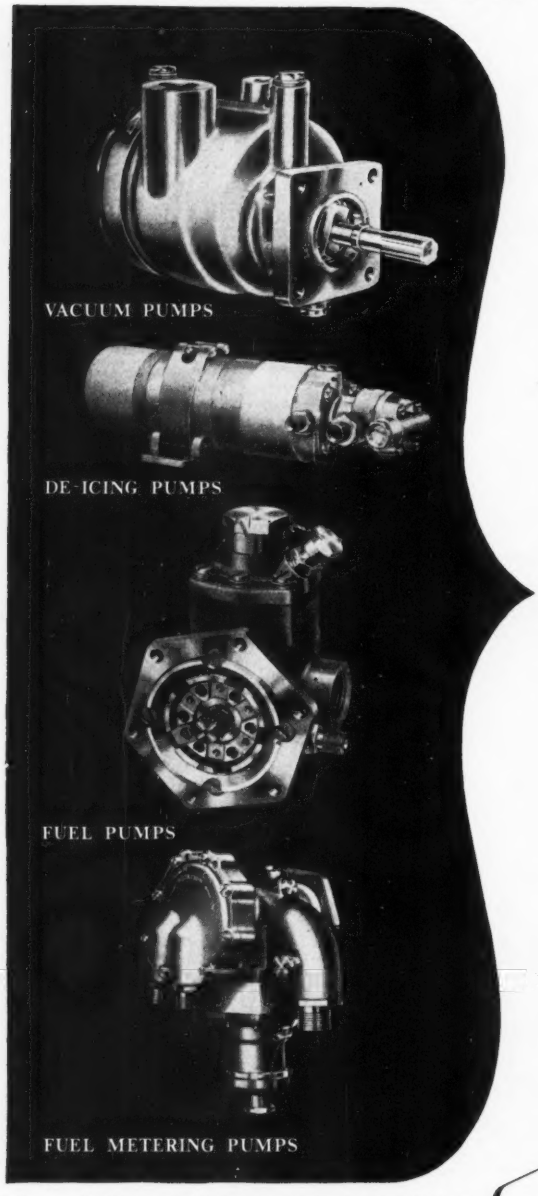
Palmer

supplied **TYRES, WHEEL ASSEMBLIES, BRAKES & CONTROLS · SILVOFLEX HOSE**

★

THE PALMER TYRE LIMITED
PENFOLD ST., EDGWARE ROAD, LONDON, N.W.8

EVERY BRITISH AIRCRAFT RELIES ON PLESSEY



Most of the facts known about **PUMPS** for aircraft are known by

Plessey

The standard range of Plessey pumps meets most aircraft requirements. For any special purpose application the experience of Plessey designers is at your service, supported by the resources of the finest production unit of its type in the country.

Executives in the aircraft industry can ensure keeping up-to-date with the latest developments in Plessey pumps and valves by writing for publication No. 348.

PUMPS · VALVES · CARTRIDGE STARTERS · BREEZE' WIRING SYSTEMS · ELECTRIC ACTUATORS · RADIO COMMUNICATIONS

THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

AC 10

It's all hot air!

It is strange that hot air, which was very much in evidence at the beginning of all this aeronautical business, should again be very much the topic of the moment. Today, of course, it is a question of tapping hot air (at no mean pressure) from jet engines for various purposes—and a good many people are anxiously awaiting the successful solution of the control problem. We of Teddingtons have a series of hot air valves which we believe are going to cause quite a stir in aeronautical circles. Is this all hot air too? An opportunity of demonstrating to interested designers would certainly provide the most convincing proof.

Teddington

Teddington CONTROLS

TEDDINGTON CONTROLS LTD., CEFN COED, MERTHYR TYDFIL, SOUTH WALES. MERTHYR TYDFIL 666

T.61

FIRTH BROWN 1837-1951

EXPERIENCE & DEVELOPMENT IN HIGHEST QUALITY STEELS OF ALL GRADES

As manufacturers of Alloy Steels for High Duty, Firth Brown's contribution to industry is world wide, whether it be steels for engineering, shipbuilding, automobile, aircraft, road and rail transport or for the most minute mechanisms of the precision engineering industries. Firth Brown Steels were used for parts of the "Canberra," built by the English Electric Company.

LIST OF PRODUCTS

Forgings—Light and Heavy, for special and general engineering.

Forged Steel Drums and Pressure Vessels.

Hardened Steel Rolls.

Carbon and Alloy Steel Bars and Billets.

Tyres and Laminated Springs.

High Speed and Tool and Die Steels.

Steel Castings.

Write for the Firth Brown Buyers' Guide for further particulars.

THOS. FIRTH & JOHN BROWN LTD., SHEFFIELD

B3

Impossible places

'Impossible' places are happy hunting grounds for the Sealand. Since a restricted stretch of water is all it requires to fly in and out, mountains, jungles and scattered islands are as accessible to this sturdy amphibian as any metropolitan area with imposing terminal facilities. It will travel very far North defying latitude and seasons, and it converts easily to undertake specialised tasks of all sorts—fishery service, air-sea rescue, survey, ambulance, marine aircraft conversion training, for example. And since it is economical to operate and easy to maintain, it is a profitable proposition for a variety of passenger or freight carrying duties. All in all, it has a great deal to offer business, industrial and official concerns—a great deal in fact that is well worth careful examination.

Shorts

Φ6

Designed for areas where freight and passenger carriage is impracticable for normal aircraft

SEALAND AMPHIBIAN

SHORT BROTHERS & HARLAND LIMITED,
The first manufacturers of aircraft in the world QUEENS ISLAND, BELFAST. LONDON OFFICE: 17 GROSVENOR STREET, W.1.

Do you know your airfields?

10

Recognize this airfield? It's No. 10 in this series of puzzle photographs. You'll find the answer below on the right. ★

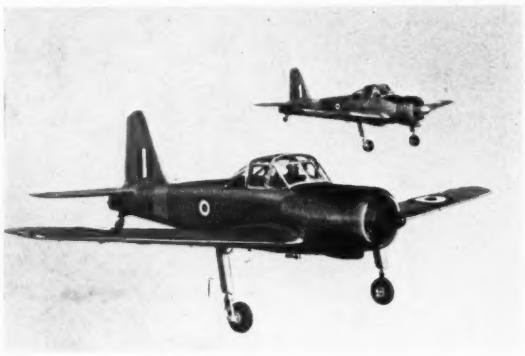
The Aircraft Servicing Vehicles of the Shell and BP Aviation Service are a familiar sight at twenty-five aerodromes throughout the country. On duty all year round, their crews service the aircraft of numerous charter companies, flying clubs, private and business owners, and twenty-three international airlines.

Shell and BP Aviation Service

Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, W.C.2.
Distributors in the U.K. for the Shell
and Anglo-Iranian Oil Groups.

★ Turnhouse, Edinburgh

The Christlea Skyjeep
BRITAIN'S LATEST LIGHT AIRCRAFT
AND WINNER OF THE 1950 GOODYEAR TROPHY!
powered by a Cirrus Major III
1BE/1



PERCIVAL P.56
BASIC TRAINER

FITTED WITH FLEXIBLE
FUEL TANKS
SUPPLIED BY

FIREPROOF TANKS LTD.

THE AIRPORT, PORTSMOUTH. TELEPHONE: PORTSMOUTH 2367-8

PERCIVAL P56
Aeroplane Photo.

We're in it, too—of course!

DURALUMIN
REGD. TRADE MARK
ALUMINIUM ALLOYS

JAMES BOOTH & COMPANY LIMITED ARGYLE STREET WORKS · BIRMINGHAM 7

From the earliest days we have supplied sections, sheet, tubes, forgings and wire to the aircraft industry.

FESTIVAL OF BRITAIN – 1951 – Power and Production Building

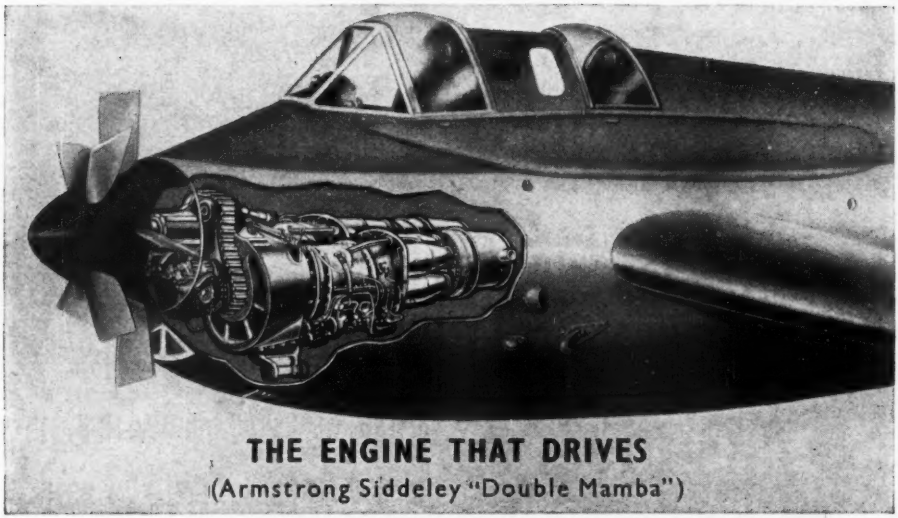
SELECTED FOR THE SINGLE EXHIBIT REPRESENTING AN OUTSTANDING BRITISH RESEARCH ACHIEVEMENT IN THE NON-FERROUS METALS INDUSTRY

"Elektron" magnesium casting alloys containing zirconium and rare earth metals, highly resistant to creep at elevated temperatures, under service conditions up to 250°C., have been selected for the single exhibit representing an outstanding British research and development achievement in the non-ferrous metals industry. The results of this research made available to the aircraft industry, at a critical phase in the development of jet and propeller turbine engines, ultra-light alloys possessing remarkably improved properties at the high running temperatures of modern engines, thus solving one of the designer's main problems and helping British aero engine constructors to achieve a leading position in the aircraft turbine engine field. Britain pioneered these alloys and they are now being cast under licence in the U.S.A., Canada, Australia, Sweden, Switzerland and Holland.

MAGNESIUM ELEKTRON LIMITED

CLIFTON JUNCTION, MANCHESTER · LONDON OFFICE: BATH HOUSE, 82 PICCADILLY, W.1

B



THE ENGINE THAT DRIVES
(Armstrong Siddeley "Double Mamba")

THE AIRCRAFT THAT STRIKES
Twin Engine Performance—Single Engine Installation

TWIN-ENGINED • ANTI-SUBMARINE
CARRIER-OPERATED
FAIREY 17
THE FAIREY AVIATION COMPANY LTD., HAYES, MIDDLESEX

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2206. Vol. LIX. FRIDAY, 4 MAY 1951

EDITORIAL DIRECTOR
G. GEOFFREY SMITH, M.B.E.

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

TECHNICAL EDITOR
C. B. BAILEY-WATSON, B.A.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:
DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

COVENTRY
8-10, Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
King Edward House,
New Street.
Telegrams, Autopress, Birmingham.
Telephone, Midland 7191 (7 lines).

MANCHESTER, 3
260, Deansgate.
Telegrams, Iliffe, Manchester.
Telephone, Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2
26b, Renfield Street.
Telegrams, Iliffe, Glasgow.
Telephone, Central 4857.

SUBSCRIPTION RATES
Home and Overseas: Twelve months £3 3s. 0d. U.S.A. and Canada, $10.00
BY AIR: To Canada and U.S.A., six months, $16.

IN THIS ISSUE:

Angola by Aerovan - 518
Speed in Gliding - - 524
Naval Target Tug - - 526
Percival P.56 - - - 527
Evolution of the Guided Missile - - - 534

The Festival Year

YESTERDAY—May 3rd—the Festival of Britain was due to be opened with all the pomp and circumstance appropriate to such a vast and costly enterprise.

Events leading up to the inauguration of the Festival have been far from auspicious, though a recent preliminary tour of the South Bank site (with a truly appalling amount of work remaining to be done in the fast-dwindling time) confirmed us in the opinion that this manifestation of national endeavour is, in general, a worthy one. But while recognizing the exasperating restrictions on space and scope imposed upon those responsible, we came away somewhat disappointed in what we had seen of the Air Transport section. True, many exhibits had not arrived, but the four complete aircraft, which dominate the section by their very bulk, were in position. They are, as we have already reported, the original de Havilland Comet long-distance racer of 1934, a Supermarine S.6B seaplane, and two gliders.

With the showing of a single sailplane we would have no quarrel, for this type of aircraft truly epitomizes the peace and beauty of flight; but that two examples should be allotted so much precious space is, to our mind, regrettable in that the whole historical theme is thereby thrown out of balance.

That the organizers were at their wits' ends in selecting the fourth aircraft we have no doubt, and sympathize accordingly; but no pains should have been spared to secure the Gloster-Whittle E. 28/39, now deposited in the National Aeronautical Collection at South Kensington. Historically, this little machine is the most significant ever built in this country, for it was the first British aircraft to fly with turbine power. To us Britons it is—or should be—what the Wright brothers' biplane is to the Americans. Nothing should have been allowed to prevent its exhibition on the South Bank, especially so as the evolution of the gas-turbine power plant is admirably typified by an early Whittle and examples of the Python, Derwent, Ghost and Proteus.

In view of the unavoidable deficiencies of the Festival display, we would strongly urge interested friends from abroad—who will, we hope, be converging on our island this summer—to supplement their South Bank visit with a call at the National Aeronautical Collection. Here they will be enabled to examine the historic little Gloster jet at close quarters. They will find it in the company of some equally illustrious machines of earlier days and surrounded by a variety of exhibits which fill in, as it were, the outline sketched on the South Bank. The story told by the National Aeronautical Collection is one in which we take a deep national pride and from which many a young man has drawn inspiration.

Those who find themselves in England during the third week of July must not fail to visit the old aerodrome at Hendon for the Royal Aero Club's "Fifty Years of Flying" exhibition and display, in celebration of the jubilee of the Royal Aero Club. This promises to be not only a pageant of progress but a social event of extraordinary appeal, and one which will arouse warm memories of the gay, sporting events put on there before 1914. In these affairs can be seen the origins of classic British flying meetings, typified this year by the Festival of Britain 1951 National Air Races at Hatfield on June 23rd.

The organizers of the Hendon display, incidentally, would welcome the loan of any bygone aircraft now in private hands, and it is to be hoped that the occasion will bring to the light of day some veteran machines which must still be lying half-forgotten in dark corners. That it is intended to fly a number of these old-timers is especially pleasing, and, given the halcyon weather always associated with Hendon displays, the event should be a memorable climax to a programme of Festival pageantry. It will, moreover, form a fitting prelude to the greatest of all British air-shows—the Display and Exhibition of the Society of British Aircraft Constructors at Farnborough, between September 11th and 16th. This annual event is perennially a festival occasion in that the latest and best in British Flying Equipment is concentrated for several days for inspection and demonstration. Without doubt it will prove, as have all displays of the series, that the heritage of our aircraft industry—the theme of the Festival exhibition—has not fallen into prodigal hands.

ANGOLA BY AEROVAN

Diary of a Not Uneventful Delivery Flight Across Spain and Down the West African Coast

By MARTIN CHERRY

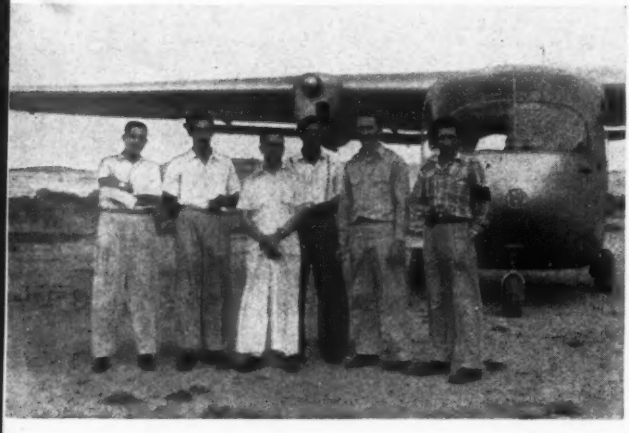
ON January 31st, at 0900 hours, we took off in Aerovan G-AKKJ from Woodley airport for Gatwick, where customs clearance was to be made. The machine finally cleared and at mid-day we left on the first hop of a 6,700-mile flight to Anglo-Portuguese South-West Africa. The first scheduled stop was Bordeaux, which should have been reached at 1630 hr, but, like everything else on this trip, the programme changed. The weather was fine as we crossed the channel but soon after reaching the Cherbourg Peninsula scattered clouds were encountered and eventually we were flying under a layer of complete cloud at about 1,000 ft above ground level.

The ceiling gradually became lower and 100 miles north of Bordeaux we finally went on to instruments about 200 feet above the ground level. As the radio was not working this sort of thing was not good enough and we returned on the reciprocal course—namely, out into the clear again. One more attempt was made to get through in what looked like a clear patch but the same sort of thing happened, and, after talking with my co-pilot, Sr. Vas Monteiro, we decided that the best alternative was the French Air Force base of Tours. We landed there at approximately 1700 hr. Being the centre of La Touraine, Tours is a very popular holiday area, particularly for English people. I believe there are many fine chateaux to be visited in this area in the good season; but we saw one night club.

We were compelled to wait in Tours for one more day, due to fog in the South of France, and on the following day we had to wait 2½ hours at the airfield for a battery car, even after the French had used all the well-worn phrases of "toute suite," "immediatement," "bientôt," "ah oui, monsieur"—all of which, as we know, is their way of saying "five minutes." Because of this delay we landed at Bilbao just as darkness fell at 1800 hr.

We left the aircraft picketed on Bilbao airfield, which was an attractive little place, but completely lacking in every facility, as will be seen later. It was here that the fun started. At 2000 hr,

Crew and helpers pose for a photograph with the Aerovan at one of the little airfields operated by the fisheries company from Benguella.



after a very pleasant night at the Hotel Carlton, we heard the telephone ring and a Spanish voice say, "Mr. Cherry, the wing of the plane is broken." That caused panic—until the voice added, "Never mind, it is only a small hole where the picketing rope is."

I went to the airfield and looked up at the sun through the small hole, which measured 3in x 2½in. During the night the wind had changed 90 deg, reached 50 miles an hour, and snapped the picketing rope; and the machine had fallen sideways on to a 44-gallon oil drum. Fortunately the only structural damage was to plywood and ribs and the main spar was unaffected.

Thanks to the assistance of Señor Prado—a Bilbao industrialist—and the office staff of Aviacion y Comercio, I was able to get a mechanic from the town to make a temporary repair and was also able to prevail on the commandant to allow me to park the aircraft on the lee side of the terminal building, as the wind was still strong.

On Through Spain

Bilbao airfield was not yet completed; there was a lovely terminal building with a bar without beer, a restaurant without food, and offices without telephones. There were no hangars and the normal picketing area was exposed to the prevailing wind. Nevertheless, it should be a very pleasant stop for British tourists. Customs facilities now exist in Bilbao.

On February 5th the machine was ready and, after a test flight, we received weather reports saying that all was fine. The flight plan told us that an alternative airfield, should we be unable to land at Madrid, was Burgos. Just before mid-day we took off for Madrid and had a very bumpy passage through the North Spanish mountains. After 1½ hours' flying, we passed over Burgos, only to find that the town and airfield were completely covered in heavy snow. I turned the aircraft south towards the plains and what I hoped would be better weather, as the ceiling at Burgos itself was at approximately 400 ft. Gradually the snow on the ground thinned out, but the weather overhead remained poor. There was no question of returning to Bilbao, because of extreme turbulence in the mountains, but as the ground conditions were good, and my map showed another alternative airfield at Arranda de Duero, there was really nothing to worry about. I flew for about one hour more to the Somo mountains which rise to 7,000 ft; and, of course, immediately we reached the foothills it became obvious that we could not pass. So we returned to Aranda de Duero, 15 minutes away. Light rain was starting to fall and this soon became a gentle snowfall. The trouble started when I reached Aranda and could not find the airfield, and circled for three-quarters of an hour in an attempt to find a satisfactory place to put down. Every square foot of ground seemed to be ploughed. The snow was coming down faster by this time, but there was still no reason to land immediately as visibility was about a mile, and not deteriorating; the ceiling was 300 ft. Eventually I found a car track through a ploughed field and hoped that, if it was good enough for a car, it would take the Aerovan. I went in and landed. Three very happy people stepped out of the aircraft, the co-pilot's wife putting away the St. Christophers.

The Chief of Police arrived and rather tersely wanted to know why we had caused "this disturbance," so I tersely inquired as to the whereabouts of his airfield. He replied, "Ah, si, señor, there was one here about ten years ago but it is not here now. There is a new one ten miles away, but maybe you are fortunate you do not go there, because the ground is soft and certainly you would break the aeroplane." So we were all friends.

Hosts of people gathered, but after the guards were posted and the aircraft picketed, we went off to a very nice Spanish Government road-house on the main highway some miles away.

The Commandant of Burgos airfield called in to make an inquiry on behalf of the Spanish Air Force as to why we had caused the trouble, and immediately asked me for a copy of my weather report from Bilbao. I showed him the report and he was amazed. He then wanted to see the flight plan and, after reading Burgos as the alternative, said "That is my airport." I replied that I knew this, and he said "I cannot understand why they give you this alternative, because we are under three feet of snow at Burgos and the airfield has been closed for ten days." I realize now that in Spain people do not tell other people these little things; perhaps the reason is that there is no priority system for air traffic telephone calls, so that any information passed on is usually out of date by the time it is received. We had a few drinks with the Commandant and then he returned to his base.

Down to Casablanca

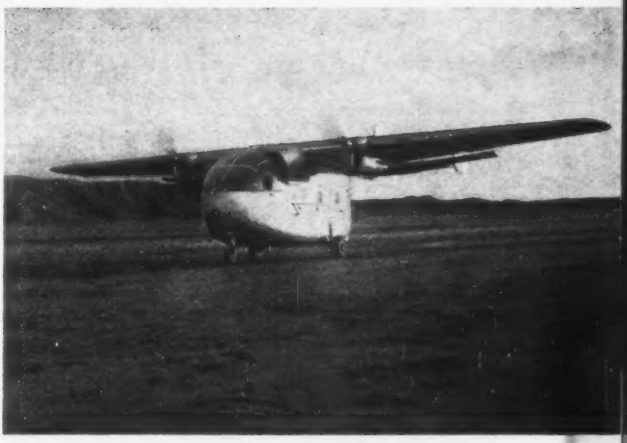
The Chief of Police came to see me again and said that a Spanish military aircraft was missing on the same route. I learned subsequently that some days later it was found on a mountain about 40 miles south of Madrid; the crew had been killed.

We decided at Aranda that the co-pilot and his wife, together with the baggage and spares, should go on to Madrid by train and that I should wait for a strong enough wind to take the aircraft off and fly to the Spanish capital. I got there on February 8th, after making a very devious flight around the Somo mountains and entering from the south-west along a valley.

After talks with the agent of Handley Page (Reading), Ltd., Señor Escario, I put the aircraft into the hands of a Spanish company, asking them to repair the wing completely and to make several small adjustments. We had five enjoyable days in Madrid at the Hotel Velasquez; and, as at all other places in Spain, I found the civilians most courteous.

Eventually the machine was ready and on February 13th we took off again for Casablanca. Everything was magnificent; but when we were one hour out from Madrid the starboard wing dropped violently and then came up again, with the aircraft vibrating continuously. I looked at engines, props and instruments and then saw about eight square feet of fabric caught in the starboard aileron and trailing behind in the slipstream; it was flapping viciously, so causing an oscillation in the ailerons and vibration throughout the aircraft. The co-pilot insisted we must land immediately, but the only factor against that was that we were over snow-covered mountains, so I decided to return to Madrid; and after 1 hour 10 minutes we landed again in Barrajas. I tackled

"Staggering on" is the author's caption to this snapshot in the cockpit.



At Benguella: What the Aerovan lacks in beauty it makes up for in utility.

the Spanish mechanics about the quality of their dope used in the patching work that they had done; they replied that they "did not use any dope, as we thought you were in a hurry." I could not resist telling them I was not in that much of a hurry.

We started a new mechanic on the job; he was supervised by Mr. Arthur Frye, the British European Airways Resident Engineer in Madrid, and on February 16th we took off again for Casablanca. Even here, in the Spanish capital, the weather information that we got from Gibraltar and Casablanca was seven hours old, which I do not consider good enough for the airport of a European capital.

The first half of the voyage to Casablanca was not too bad, except that we were obliged by cloud to fly along valleys, find passes through the mountain ranges, and then follow along other valleys, so that by the time we were near Tangier we were absolutely exhausted and running short of petrol; we therefore went in and landed at Tangier. More trouble! The French customs officer at the airport and the Chief of Customs had no previous experience of dealing with an aircraft travelling on a delivery flight; they kept insisting on a *carnet de passage*. I tried to explain, for some hours, that a new machine flew on an export licence, and that as it was going on a delivery flight to another country and remaining there, a *carnet* was impossible. They could not see this, and I had to appeal to Mr. Boam, the British Vice-Consul. He fixed everything with them but, even so, it was necessary to fill in forms for one more hour. Travellers should be warned against people who do not know their own customs regulations; in my case, after four hours of hard flying, I had 3½ hours of form-filling, and then an £8 taxi bill to pay. Not conducive to good temper!

Africa's West Coast

On the 17th we flew Tangier-Casablanca without incident, except that by now there was no money left. Just a small factor.

On the 18th we went from Casablanca to Agadir and were amazed to see the floods in Southern Morocco. This sight supported the information we had previously received that the weather all over the world during the past winter had been most unusual. It may be consolation to those in England to know that they have not been the only people with a bad winter.

We had a very pleasant night in Agadir, finishing at midnight at the Casbah, an old Dutch fortress built on a mountain peak overlooking the town. We were taken there by the local manager of the Shell Company (Shell service again standing out!) and some of his French and Belgian friends. There was one more incident that night—a race down the mountainside by about seven French cars—Delahayes, Citroens, Panhards, etc. I didn't like it at all, but at least was in the winning car, driven by a Belgian who is the champion sports car driver of Southern Morocco.

We were ready to leave the next day for Villa Cisneros when some French Air Force lieutenant decided we could not go "because we carried no radio." We told him we did, and showed it to him. He then decided we could not go because there were two passengers in the aircraft. I insisted that they were co-pilot and supernumerary. He then said we could not go because we had no maps—or, at least, he wanted to see them. After being told that he was exceeding his authority and that we had permission from the

ANGOLA BY AEROVAN . . .

Air Ministry and the French Government to make the flight, he said that we could not go because we had no desert equipment. Finally we were cleared for Ifni, a Spanish possession 80 miles south. We landed in there at mid-day. It is a most remarkable airfield on a cliff 400 ft above the sea and at the side of a 3,000-ft mountain.

We cleared again, and at 1845 hr on February 19th we landed at Villa Cisneros after a 4 hr 40 min flight along the desert coast.

Followed a first-class night with the Commandant Sanchez, and then an early start for St. Louis. This leg was particularly trying; the first two hours were fine and calm but, as the heat of the day developed, the sand haze came up to about 2,000 ft and for the next three-and-a-half hours the weather was continuously turbulent. After staying one-and-a-half hours at St. Louis for refuelling, we pressed on again for Bathurst, 150 miles away. We touched down at 1630 hr, with visibility about three miles. As we finished our landing run the starboard engine stopped. I restarted it and taxied in to the dispersal area.

Next morning I took out the filter bowls and found in each at least a quarter of an inch of sand that had accumulated from the previous day's flying. There was also water in the petrol, which possibly came from St. Louis. We did the necessary cleaning to rectify these troubles. If using a low-octane fuel in Africa one cannot be too careful, as it is often necessary for it to be stored for some months; and in a climate such as West and Central Africa water-accumulation is inevitable.

We took off that evening for Bissao, and immediately I left the ground I found that the air-speed indicator had stopped working; visibility was only about four miles; and after a few minutes one engine started to run a little rough again. My co-pilot told me the airfield at Bissao was very small and that there were no night landing facilities, so we returned again to Banthurst. We were having carburettor trouble on one engine and the next afternoon a Portuguese Gemini arrived from Bissao and the flight engineer worked on the faulty unit for about an hour until all was well.

We stayed the night at the house of Mr. Rashid, a Lebanese gentleman who gave all of us—by now six people—every hospitality; and in the morning the two aircraft took off for Bissao. The deputy commandant of Bissao flew with me in the Aerovan on this stage, as did the co-pilot, but the co-pilot's wife went with the flight engineer and the commandant of Bissao in the Gemini. Strangley enough the Aerovan arrived first and, after flying around the town and doing a mild shoot-up, we landed for a well-earned two days' rest and for complete servicing of the aircraft.

The co-pilot and his wife decided that they would stay in Bissao for a few days' holiday and go on later to Angola by airline. So, on February 25th, I took off alone for the remaining half of the journey. All went well. On the same night I stayed in Freetown and the next day I went on without incident to Robertsfield, staying at the airfield with Capt. Wagner, vice-president of Liberian International Airways, and his very charming young American wife.

Next day was a cracker. Taking off from Robertsfield at 0700 hr, I flew for 4 hr 20 min to Abidjan and stayed there just to refuel. I then took off for Lagos and 5 hr 20 min later, at approximately 1800 hr, landed in there. Nine hours ten minutes flying for the day! I remained in Lagos for two nights and then, on March 1st, flew to Duala for refuelling. Due to primer pump troubles, I was not able to start one engine and so stayed the night. On March 2nd I flew to Libreville in 2 hr 30 min and then, after another four hours' flying over thick jungle, arrived at Point Noire.

The weather during this last day had been excellent until 50 miles before Point Noire, and I had to go out to sea and fly around two of the most violent thunderstorms that I had ever encountered. Fortunately, on arriving at the destination, I found the airfield itself was clear, so all went well.

On March 3rd, at 0730, G-AKKJ was once more airborne for Luanda and arrived there three hours later, to be met by Mr. Hollis, local manager of the Angola Coaling Company, our sub-agents for this territory.

It was necessary for the machine to stay there three days for acceptance by the local aeronautical authorities, which included flying by Capt. Euripides, the Government representative, and Captains Medina and Cruceiro of D.T.A. They all flew the Aerovan and agreed that it was very easy, and should be able to do the work for which it was intended—namely, flying supplies into the small "fisheries" airfields on the coast.

On March 6th—and by this time much to my relief—came the last leg from Luanda to Benguella and at 1810 hr AKKJ touched down at the Aero Club at Benguella airfield. The flying club there is run by the local fisheries company and was of particular interest to me because I had delivered their first twin-engined machine—a Gemini—two years earlier. They now have a fleet of two Piper Cubs, a Gemini and an Aerovan and, apart from their club work, do supply trips into the fisheries outposts; they are often urgently called on to make immediate ambulance flights or important business trips to all parts of the colony of Angola.

I was met by Mr. Tuscano, president of this interesting outfit, by his pilots, by the manager of our agents, Mr. Guardardo, and by his assistant Mr. "Tich" Park, who is an ex-R.A.F. squadron leader and a nephew of Air Marshal Sir Keith Park. Under protest, they rushed me straight into the bar and everyone was happy.

For the next seven days I did joy-rides for the Press and officials. I also made a visit to three of the most difficult fisheries airfields, carrying a good load as a demonstration. In each case the Aerovan was able to land and take-off when necessary in half the available distance. I also did a conversion for Señor Belem, who is to fly the machine while it is in Angola.

I went back to Luanda and then from Luanda to Leopoldville by D.T.A. and on to Brussels and London by Sabena, taking two days and three hours. The journey out had taken five weeks. It had been good fun, if a little tiring.

FROM ALL QUARTERS

Standard-built Avons?

SIR JOHN BLACK, managing director of the Standard Motor Co., announced on April 26th that his firm has accepted an invitation from the Ministry of Supply to investigate the possibilities of large-scale production of the Rolls-Royce Avon turbojet.

A team from the Standard Company is now at the Rolls-Royce works and Sir John Black has undertaken to give a decision within a fortnight from the date of his announcement.

Meet Your Neighbour

"ENTERPRISING" is the appropriate word to describe de Havillands' idea of throwing open the Hatfield factory and airfield to any and all neighbouring residents who cared to go along last Saturday. The success of the whole idea is indicated by the number of neighbours who accepted the invitation—six thousand tickets were issued, but we are quite sure that nearer eight thousand people were present.

Quite naturally, the doors to some parts of the factory remained locked, but nobody minded: there was too much to see anyway. Housewives were impressed by the all-pervading cleanliness, and children loved the sand-pit, which was the press-tool foundry floor. Handymen-about-the-house looked with admiration at the serried ranks of machine-tools, and young and old alike marvelled at the ability of the rubber die-press.

The object was to show local residents that the sometimes great amount of noise they had occasionally to suffer was unavoidable in the vital work being carried out there. There is, however, every prospect of relief in the future from much of the noise associated with the engine test-beds. The company have added a Cullum silencer to one of the beds, and its effectiveness is astonishing. Standing but a few feet away from the exhaust end of the silencer, all that one can hear is a very faint murmur.

Outside on the airfield, beneath threatening, livid clouds, were lined up a Chipmunk, Vampire, Vampire Trainer, two Doves, a Heron, and No. 3 Comet; a little way away, on the concrete apron, stood No. 1 Comet. The modest but very pleasant family flying display which went on during the afternoon comprised formation work by three Chipmunks from Panshanger, individual Chipmunk aerobatics by Pat Fillingham, a quiet and gentlemanly demonstration of the Heron by Geoffrey Pike, silky-smooth and almost whisperingly-quiet transits of No. 1 Comet by John Cunningham and, to wind up the day, a typically polished demonstration of high-speed aerobatics by John Derry in a Venom.

Sea Balliol Adopted

THE name "Sea Balliol" has been conferred on the Naval development of the Boulton Paul Balliol advanced trainer, already ordered in quantity for the R.A.F., and, following deck-landing trials aboard H.M.S. *Illustrious*, contracts for "a substantial number" have been placed with Boulton Paul Aircraft Ltd. on behalf of the Admiralty.

A development of the Balliol T.2 (Rolls-Royce Merlin 35), the Sea Balliol differs in having an arrester hook, a smaller-diameter

IN THE NAVY NOW: A Boulton Paul Sea Balliol, as adopted by the Royal Navy (see accompanying news item), is seen during deck trials.

airscrew and new main-wheel and tail-wheel units. Certain alterations have been made to equipment and instrumentation.

The Balliol is noted for its control characteristics, and its responsiveness at low approach speeds render it especially suitable for deck-landing instruction and practice. The wing-mounted dive brakes will enable the Sea Balliol to be used for training in low-level bombing.

Blackburn Resignation

FROM Blackburn and General Aircraft, Ltd., comes the announcement that, for personal reasons, Sir Maurice Denny, Bt., K.B.E., B.Sc., M.I.C.E., M.I.N.A., has resigned from the board of that company and Blackburn (Dumbarton), Ltd.

Sir Maurice has many marine and aeronautical associations. He was chairman of Blackburn (Dumbarton), Ltd., and continues as a director of Guest, Keen and Nettlefolds, Ltd. From the inception of the Air Registration Board in 1937 he was chairman until 1946, and is at present a vice-chairman.

A.D.A.'s New President

AT the recent annual general meeting of the Aluminium Development Association Mr. Austyn Reynolds, B.A., A.M.I.Mech.E., A.F.R.Ae.S., was elected president for 1951/2. Mr. Reynolds is a director of Tube Investments, Ltd., and deputy chairman of T.I. Aluminium, Ltd., and the associated companies. He has served on the A.D.A. council for six years and was vice-president last year.

The new vice-president is Mr. H. G. Herrington (High Duty Alloys, Ltd.). Mr. F. G. Woollard, M.B.E., M.I.Mech.E., M.I.P.E., M.S.A.E., was re-elected chairman of the executive committee.

In his report on the year's work the retiring president, Mr. Edward Player, mentioned that the A.D.A. had answered over 3,600 inquiries and that its library had made 985 loans.

At the B.I.F.

OCCUPYING over a million square feet of exhibition areas in London and Birmingham, the 1951 British Industries Fair opened last Monday. This old-established exhibition is the first event in the six-month Festival season, and will remain open until May 11th.

Although the aircraft industry reserves its main export effort for the S.B.A.C. Show in September, the engineering section of the B.I.F. at Castle Bromwich Airfield, Birmingham, is not without aeronautical interest. Typical of the companies exhibiting materials for aircraft and other industrial purposes is Cellon, Ltd., who show Cerrux, Cerric and Cellon finishes for a variety of applications. Chloride Batteries, Ltd.—who, incidentally, have made important contributions to the South Bank Exhibition—display aircraft batteries in the lightweight polythene containers. Marconi mobile V.H.F. communications systems, radar and navaids are to be seen on one of the most attractively presented stands in the Fair; other exhibitors in the electrical section are Venner Time Switches, Ltd., and Chance Brothers, Ltd.

Aircraft cowlings lent by B.E.A. are used in demonstrations of the new Jenolite degreaser and cleaner for aluminium. Another aircraft component on show is a beautifully sectioned Derwent 5, provided by Rolls-Royce, Ltd., for the "Derby for Industry" stand. Simmonds Aerocessories, Ltd., are showing their range of products, and among other exhibitors well known in the industry are the Airscrew Co., Ltd., Anglo-American Oil Co., Ltd., B.B. Chemical Co., Ltd., Bakelite, Ltd., Bells Asbestos and Engineering, Ltd., British Insulated Callenders Cables, Ltd., the David Brown Group, Desoutter Bros., Ltd., Dunlop Rubber Co., Ltd., Goodyear Tyre and Rubber Co. (Great Britain), Ltd., Guest, Keen and Nettlefolds Group, Hymatic Engineering Co., Ltd., B. O. Morris, Ltd., The Palmer Tyre, Ltd., Pritchett and Gold and E.P.S., Ltd., Saunders Valve Co., Ltd., Shell-Mex and B.P., Ltd., Standard Telephones and Cables, Ltd., and Vokes, Ltd.

In addition, the majority of the leading producers of light alloys, and the steel companies, are represented. B.E.A. and B.O.A.C. have stands, and, lastly, the Associated Iliffe Press (of which this journal is a publication) are in the show.

At the London section of the Fair (Earls Court and Olympia), most of the leading manufacturers of plastics, radio and radar apparatus and scientific and optical instruments have stands.

Shell-Mex Appointments

FROM Shell-Mex and J.P., Ltd., comes the announcement of the retirement of Mr. C. M. Merrick, their managing director. Mr. Merrick, who was educated at Victoria College, Jersey, and Pembroke College, Oxford, joined the Asiatic Petroleum Company (now the Shell Petroleum Company) in 1924. He gained his early experience of the oil industry in British Malaya, becoming a branch manager in 1928 and general sales manager in the Singapore head office in 1933. Returning home in 1936 he was transferred to Shell-Mex and B.P., Ltd., and was appointed assistant general manager in 1938 and deputy general manager in 1944. In 1945 he was appointed managing director.

Mr. Merrick is succeeded by Mr. C. M. Vignoles, O.B.E. Educated at Sedbergh and Magdalen College, Cambridge, he joined the Royal Dutch-Shell Group in 1924 and, in the early part of his career, served in the Far East. In 1932 he was transferred to the company's fuel-oil general department in London. He served as a member of the Overseas Supply Committee of the Petroleum Board until May, 1940, when he was seconded to it to undertake full-time executive duties, later becoming joint executive secretary. For his services he was awarded the O.B.E. in 1946. After the war Mr. Vignoles was appointed Eastern Area manager of the Shell Petroleum Co. and became a director of Shell-Mex and B.P. in November, 1950.

R.-R. Joint Managing Director

IT was announced last week that Mr. A. G. Elliott, C.B.E., M.I.Mech.E., F.R.Ae.S., M.S.A.E., has been appointed joint managing director of Rolls-Royce, Ltd., with Lord Hives, C.H.

Mr. A. G. Elliott.

Mr. A. G. Elliott, a native of London, joined Rolls-Royce in 1912, taking charge of the engine design and drawing office. Previously he had been responsible for engine design in the Napier company. In his first year with Rolls-Royce he was on the personal staff of the late Sir Henry Royce, with whom he worked intimately for 20 years in the south of England.

In 1929 he was appointed chief designer, responsible for both motor-car and aircraft engine design; he occupied that position until 1937, when he was made chief engineer of the aero division. He became chief engineer to the company in 1937 and was appointed to the board in March, 1945. In 1941 he was awarded the C.B.E. in recognition of his work on aircraft-engine development.

B.O.A.C. Dismissals: M.P.'s Allegation

IN the House of Commons on April 26th, Mr. Cooper (Lab., Middlesbrough West) asked the Speaker whether a question of privilege arose in the case of two men who, he alleged, had been dismissed from B.O.A.C. on the excuse of redundancy but who, from evidence in his possession, he believed to have been dismissed because they had given certain information to him as an M.P.

Mr. Cooper stated that both men had been employed in the Corporation's signals section. On leaving the R.A.F. shortly after the war, one of them had advocated the organization of an international signals organization; his proposals were adopted, and International Aeradio, Ltd., came into being. The man was not asked to join the new body, but remained with the B.O.A.C. signals section, which was gradually absorbed into it. Eventually he and an ex-R.A.F. colleague were dismissed as redundant, while others of less experience were recruited into International Aeradio.

The two, alleged Mr. Cooper, had previously made to him criticisms of I.A.L. policy, criticisms which the Ministry of Civil Aviation had later admitted to be proved, with the result that changes in the I.A.L. organization were made. The evidence of their exposure of these defects, he said, had cost the men their jobs.

The Speaker having ruled that privilege could not be extended to cover the case, Mr. Cooper asked leave to move that it be made the subject of an inquiry by a Select Committee. The Speaker then suggested that he should put down a motion for consideration by the Government.

HERE AND THERE

The Jet Era

NEXT week's issue of *Flight*, May 11th, will be an enlarged number mainly devoted to jet aircraft and gas-turbine development; specially illustrated reviews of both historical and current types will be included. All who are interested in the subject should make certain of obtaining this important issue by placing orders with their newsagents.

In the Festival Road Show

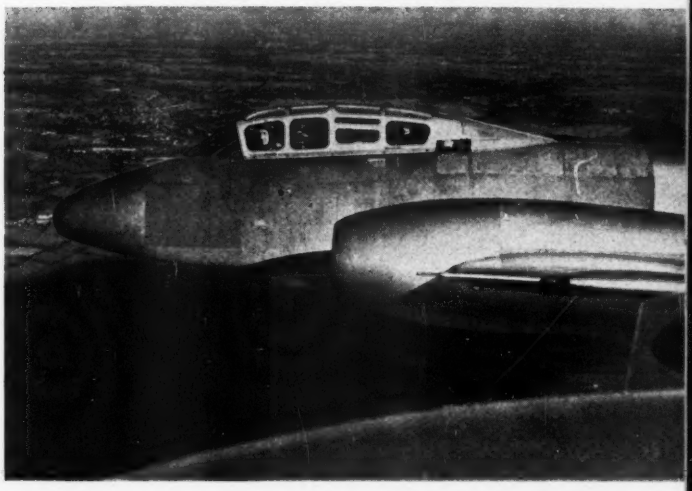
THE Whittle W2/700 turbojet will be one of the exhibits in the Festival of Britain Land-travelling Exhibition which opens at the City Hall, Manchester, tomorrow, May 5th. Alongside this historic unit will be other gas turbines, early and modern, loaned by the National Gas Turbine Establishment, while the respective manufacturers have contributed an Adder and a Goblin. Nautical and industrial gas-turbine exhibits come from B.T.H., Parsons, Metropolitan-Vickers and other firms.

The Gipsy's Revenge

ACCORDING to reports from Durban on Saturday, A. Cdre. Sir Frank Whittle made an exemplary "dead-stick" landing in a Tiger Moth when its engine cut out completely at 1,500ft in a loop. He was practising aerobatics at the time—his first spell at the controls in six years. Well worth quoting is Sir Frank's classic comment on the incident: "It was a case of the piston engine getting its own back on me."

Busiest British Airfield

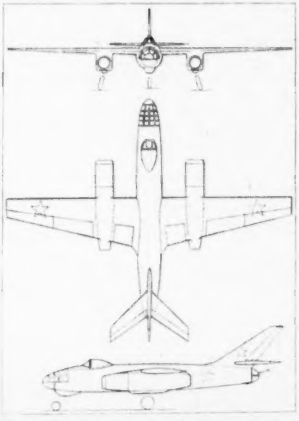
DURING 1950, the Air Service Training airfield at Hamble, Southampton, handled a record total of aircraft movements—74,782 take-offs and landings, a daily average of 205. The runner up was a R.A.F. training station (unnamed for security reasons) with a total of 60,790. Total movements at London Airport and Northolt last year were respectively, 37,776 and 58,848. Flights from Hamble, all made without incident, included the first take-off of the Sapphire-Meteor.



FOURSOME: Gloster test-pilots Mike Kilburn (front cockpit) and Brian Smith pose for their photograph in a Meteor 7; Jim Cooksey flies alongside in another Mk 7; and Russell Adams presses the trigger of his Speed Graphic—producing this unusually snug study of the 600-m.p.h. trainer.

Russia's "Canberra"

A CORRESPONDENT in Germany has sent us a general-arrangement drawing (reproduced here) of a Russian twin-jet bomber which resembles the machine illustrated in *Flight* of April 6th. Bombers of this type, he reports, are stationed at Oranienburg, north of Berlin. They have a surprisingly low landing speed and the design of the undercarriage—the wheels of which retract into fairings—is the subject of special comment: the main wheels, it appears, are sharply splayed out. In the tail is a large object "like the pipe of a Boeing KB-29 tanker" and which our correspondent thinks is a twin or triple gun.



SPLAY-FOOTED: Layout of Soviet twin-jet bomber, according to a correspondent in Germany (see paragraph on this page).

BRITISH VISITORS to Avro Canada, seen here inspecting the new tip-tank of the CF-100 Canuck, are (left) Sir Roy Dobson, president of the Canadian company, and Sir Frank Spriggs, managing director of the parent Hawker Siddeley Group. Their guide is S/L. Baudoux, chief R.C.A.F. test-pilot.

New Neptunes

TWO new versions of the U.S. Navy's main anti-submarine aircraft, the P2V Neptune, are announced by the Lockheed Aircraft Corporation. The latest patrol version is the P2V-5, powered by two Wright R-3350 compound engines, each of 2,350 h.p., and differing from earlier models in its acquisition of a nose turret. Internally, it carries more radar and electronic equipment. Another new Neptune is an air-sea rescue model,

GLOSTER METEOR P.V.

WITH INCREASED RANGE FOR TACTICAL GROUND ATTACK

GLOSTER AIRCRAFT COMPANY LTD • MEMBER OF THE HAWKER SIDDELEY GROUP

The Viscount introduces the turboprop to the new age of air travel, in which speed is achieved without vibration or cabin noise—and brings these benefits for the first time to short and medium ranges.

VICKERS VISCOUNT

(FOUR ROLLS-ROYCE DART PROPELLER TURBINES)

HERE AND THERE . . .

adapted to carry an airborne lifeboat; most of the normally heavy armament will be omitted unless specially required.

Both Britain and Australia have placed orders for Neptunes, and South Africa, New Zealand, Canada and the Netherlands have also shown interest in acquiring these long-range aircraft.

London Airport Enclosure

BAD weather during February and March interrupted work on the public enclosure at London Airport, and the site will not now be open to the public until after Whitsun (May 13th). The enclosure at Northolt was re-opened on April 23rd.

York's Record Load

BELIEVED to be the largest and heaviest single load ever carried by B.O.A.C., a 6½-ton propeller shaft was recently flown to Egypt by a York. Measuring 19½ft long by 2½ft thick, the shaft was required for the ship *Houston City*, stranded in Alexandria harbour.

French Tay Production

THE Hispano-Suiza Company reports good progress with the building, under licence, of Rolls-Royce Tay turbojets. Work is proceeding on a pre-production batch of ten units, which will be completed during June and July. The first French Tay will be flight-tested by the Dassault Company in a modified version of the M.D.450 Ouragan jet fighter.

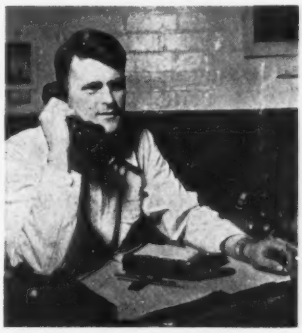
North Korean Build-up

ACCORDING to a recent estimate by the U.S.A.F., the Communist forces in North Korea now have sufficient aircraft to make between 500 and 700 sorties in 24 hours. So far, the largest Communist formation to have appeared consisted of 114 Mig-15s, which attacked U.N. aircraft along the Yalu River boundary between Korea and Manchuria. Considerable increases in enemy air strength have been observed from the air during recent weeks.

Cub Crop-sprayers

IT is estimated by the Piper Aircraft Corporation that over 1,000 Cubs have been converted by operators for crop-dusting or spraying. Piper-built agricultural versions of the Cub have also been in production for some years. The latest model has capacity for 60 gall of liquid chemicals or 9½ cu ft of "dust."

SEARCHER: The Handley Page Hermes II prototype, equipped with a magnometer, was recently employed in the search for the submarine "Affray." It is pictured here on take-off from Lee-on-Solent.



S/L. J. STARKY, D.S.O., D.F.C., whose appointment as Armstrong Siddeley's chief test pilot was announced last week, is seen in his office at Bitteswell Airfield, near Coventry. Starky, a New Zealander, has undertaken most of the Sapphire's development-flying to date.

This Cub's wide speed range is particularly suitable for agricultural work: normal cruising speed is over 110 m.p.h., but with full flap the aircraft can operate at 33 m.p.h.

Light aircraft are now being used in the U.S.A. for several agricultural purposes, including fertilization, seeding, pest-control, weed-killing and defoliation (removing leaves to facilitate picking of crops, particularly cotton).

DOUBLE CONVERSION—from glider to twin-piston-engined transport, and now to jet transport—has been the unexpected lot of this remarkable aircraft. Not claimed as America's answer to the Comet, the Chase XC-123A is, nevertheless, the first U.S. pure-jet transport aircraft: with four axial-flow units (probably J-35s), it takes off in 200 yards and carries 60 troops.

IN BRIEF

THE Aircraft Golfing Society has vacancies for active members, who must be connected with aviation or the aircraft industry. Details are obtainable from the hon. secretary, Mr. Brian D. Songhurst, 55b Woodville Gardens, London, W.5.

* * *

Mullard Electonic Products, Ltd., have changed their name to Mullard, Ltd., in order to identify it more closely with the trade mark.

* * *

A. C. Cossor, Ltd., make the announcement that Mr. L. L. Roberts, general manager of Cossor Radar, Ltd., has resigned, in order to take up an important position in connection with the export side of Rootes, Ltd.

* * *

Customs duty and sales tax amounting to nearly upon £300 have had to be paid by Dunlop employees in this country on 2,500 morocco leather note wallets sent by them to Dunlop employees in Australia as a token of appreciation of 85,000 food parcels received during and since the war.

* * *

A dance for past and present students of the College of Automobile and Aeronautical Engineering (Chelsea) is being held at Victoria Hall, Bloomsbury Square, London, W.C.1, on Friday, May 18th. Tickets from the secretary of the College, at Sydney Street, London, S.W.3.

* * *

Mr. Harold Parker, A.I.E.E., C.M.B.H.I., has been appointed managing director of Walters Electrical Manufacturing Co., Ltd., Kensal Road, London, N.W.10. He succeeds Mr. E. E. Moore, who has retired, but becomes chairman, after over fifty years' service. Makers of electrical instruments since 1880, the company is A.R.B.- and A.I.D.-approved.

* * *

Commenting on a recent reference to 1951 winners of the Spitfire Mitchell Memorial Scholarships, the Academic Registrar of University College, Southampton, points out that the scholarships were in fact awarded to D. Chapman (Vickers-Armstrong) and P. A. Knowles (Bristol). The award made to C. M. Spedding (Saunders-Roe) is an honorary one carrying the distinction but no emolument.

* * *

"Pulsed Circuits for Resistance Strain-gauges," by J. G. Yates, M.A., A.M.I.E.E., is among the contributions to the first issue of *The Elliott Journal* — a periodical review of developments in engineering and physical science with particular reference to the work of Elliott Brothers (London), Ltd. The *Journal* is published from Century Works, Lewisham, London, S.E.13.

SPEED IN GLIDING

Some Suggested Methods for use in Planning Cross-country Flights

By - - - - J. C. NEILAN

IN Fig. 1 is a pictorial representation of the method by which the majority of glider cross-country flights are made, using convection currents (hereafter referred to as "thermals") for regaining height between periods of cruising descent.

In the old days, a glider was thought to have two main speeds, a soaring speed and a gliding speed. The soaring speed was that at which its sinking speed was least, and the gliding speed, usually about 3 m.p.h. faster, was that at which the flattest gliding angle in still air was achieved.

Fig. 2 shows a typical form of glider performance curve, with sinking speed plotted vertically against forward speed horizontally. The sinking speed can be seen to be a minimum at X, and the speed for the flattest glide, shown at Y, was found by drawing a tangent to the curve through the origin of the diagram. The best speed at which to glide against a head-wind could similarly be found by drawing a tangent to the curve from a point along the horizontal axis equal to the wind strength. This is seen at Z, at which speed the maximum possible distance from any given height would be flown against the wind.

In the days when flights were all made down-wind, so as to get the most help from it, speeds X and Y were all that mattered. Now, however, the performance of sailplanes has been improved to give a flatter curve, with smaller rates of descent at higher speeds than hitherto; and it is how best to use these higher cruising speeds that matters most to a pilot making competitive cross-country flights. With higher cruising speeds longer flights can be made in the limited time during which convective lift is available, or, alternatively, they make possible flights against or across the wind which were impossible with the slower machines.

Referring to Fig. 1, if section BC is flown at a speed higher than Y, the flattest gliding angle, then (i) the time taken will be less, but (ii) the point C will be at a lower altitude, and the subsequent climb CD to regain height will take longer. If, however, the thermal CD is a strong one, there will still have been an overall saving of time between points B and D, and a higher average air-speed will have been achieved. What it amounts to is that for any particular sailplane there is a certain optimum cruising speed for any particular thermal strength. The thermals are flown at the minimum sinking speed, as usual, but the cruising descents between them are flown at a speed chosen in relation to the average rate of climb, thereby achieving the maximum average air-speed, and therefore the maximum ground-speed, while maintaining the same average cruising height.

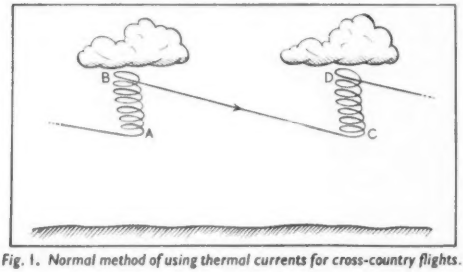


Fig. 1. Normal method of using thermal currents for cross-country flights.

Fig. 3 is simply Fig. 2 with the vertical scale extended upwards for rate of climb. By drawing a tangent to the curve from any particular rate of climb, the optimum cruising speed for that rate can be found, and the point where that tangent cuts the horizontal axis of the diagram gives the average air-speed which will be obtained under those conditions. If a higher cruising speed is used, the extra height lost in the cruise will not be regained within the time saved. If a lower cruising speed is chosen, the other fellow will be up at D while you are still somewhere between C and D. In other words, you have not made the best average air-speed or ground-speed.

It might be thought that where there is a head-wind a higher air-speed should be used, and as far as headway over the ground in a straight glide is concerned that may be so; but if the object

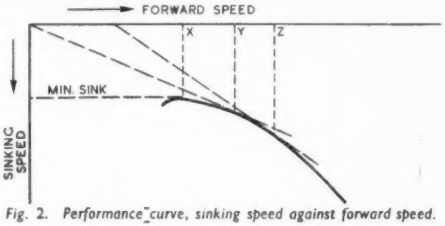


Fig. 2. Performance curve, sinking speed against forward speed.

is to continue the flight by the use of more thermals, maintaining an average cruising altitude, it will not be so. The figure for average air-speed can also be regarded as the maximum wind-speed against which any ultimate progress can be made while maintaining an average cruising height. If the wind is stronger than that figure, a positive average ground-speed in an up-wind direction can be maintained only at a higher cruising air-speed, which will either have to be balanced by stronger thermals or by a loss of average cruising height. Normally the only occasions when the optimum cruising speed can be exceeded with impunity are when there is an immediate geographical goal which can be reached in a straight glide from the current cruising height, or if the next lot of lift is capable of being used without having to circle in it. For instance, it might be a cloud street, along which one could cruise in the direction of the flight without loss of height or even with a gain of height; or there might be hill lift or standing-wave lift in which one does not drift down-wind while keeping in the lift area. For easy use in the air, it is better to tabulate the data obtained from Fig. 3 as follows:

Average rate of climb (*ft/min*)	Cruise (*m.p.h.*)	Average air-speed (*m.p.h.*)
100	43	18
150	45	22
200	47	25
250	49	28
300	51	30
350	53	32
400	55	34
450	58	35½
500	62	37

If cross-wind flights are contemplated, it may be as well to get a rough idea beforehand what course will have to be flown

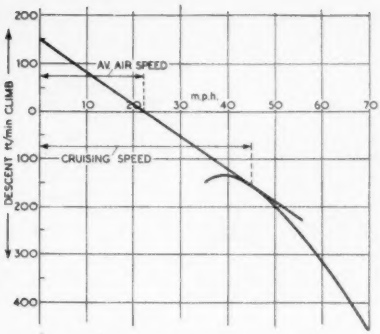


Fig. 3. Extension of Fig. 2 to give additional data.

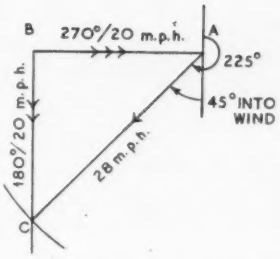


Fig. 4. Vector diagram for course and speed.

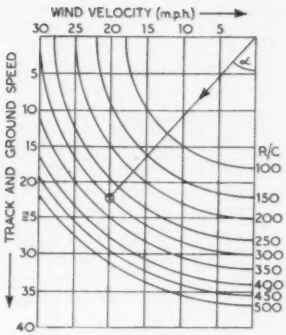


Fig. 5. Vector diagram for winds and r. of c.

during the cruising sections of the flight to make up for the down-wind drift which is taking place during the entire flight. For this purpose, the average air-speed is the figure to use in any vector diagrams. A vector diagram will enable us to find the course to fly, and the ground-speed which will be achieved in order to fly a given track under any specified wind- and air-speed.

To draw one (see Fig. 4) let us assume the following data: wind velocity 270 deg at 20 m.p.h.; required track, 180 deg; average air-speed, 28 m.p.h.

Draw a line BA in the direction 270-090 deg with a length of 20 convenient units. It is conventional to label this with three arrows pointing the way the wind is blowing. From B, the up-wind end of it, draw a line in the direction 180 deg, which represents the track, and is labelled with two arrows. Cut this track line at C with an arc of a circle, centred at A, and of radius equal to 28 units (the average air-speed). Then BC is equal in length to the ground-speed, and the angle measured at A from north clockwise to AC is the required course. In this example, the course is 225 deg and the ground-speed is 20 m.p.h. Note that the course is no less than 45 deg to windward of the track.

If nothing has been worked out beforehand, it is as well to allow about 50 deg for drift, and see how this works out in practice. It is better to make any errors bring you to the up-wind side of the track line, as once you get down-wind of it by any appreciable amount your relatively easy cross-wind flight becomes a much harder struggle against a head-wind.

As a help to seeing what is practicable and what is not in cross-wind flying, we can construct a general 90 deg vector diagram as in Fig. 5, which is simply Fig. 4 done for all wind speeds from 0 to 30 m.p.h., and with average air-speed arcs chosen corresponding to round-numbered rates of climb.

It will be seen that with an average rate of climb of 125ft/min in this glider it will be impossible to fly directly across a 20 m.p.h. wind (without losing average cruising height by using a higher cruising speed) as the course angle is at 90 deg to the track angle. In other words, under these conditions you could only just overcome your total drift by aiming straight up-wind, and if you aimed a bit off you would succeed only in making good an average track down-wind of the required one. But if the average rate of climb was 300ft/min, you would be able to make good an average track of 90 deg to the wind by flying 42 deg to windward of the track while cruising at 51 m.p.h. (giving a 30 m.p.h. average air-speed); and the ground-speed would then be about 22 m.p.h.

Now all this is, of course, theoretical. In practice your thermals are of different strengths, and no one can foretell their average strength with any degree of confidence; even if he could, that would only be half the story, for individual pilots will achieve different average rates of climb in the same thermal.

The skilled pilot will waste little time in finding and holding the strongest lift. In any particular flight you may find three or four weak thermals to every strong one, and thus to know at what speed to fly is almost impossible; but the mere fact that certain rates of climb are linked in the pilot's mind with equivalent cruising speeds will tend to prevent him from flying wastefully. Whether he can apply his theoretical knowledge in practice or not, its possession will give him a better understanding of what he is trying to do, and should improve his chances of doing it.

It is as well to point out that the average rate of climb in a thermal is very considerably less than the figure which shows on the variometer for most of the climb. There are three parts to any climb—getting in and finding the best lift, climbing at the best lift, and losing the best lift at the top. The average lift may be only a half (or less) of that during the best part of the climb. The pilot who wishes to make the maximum speed must aim at eliminating as far as possible the rounded peaks and valleys on his barograph chart caused by prolonged circling in weak lift, whether it be due (as the valleys usually are) to his slowness in getting properly centred in the best lift, or, as is usual at the peaks, to the natural slowing down of the convection owing to the lessening of temperature differences and lowering of the lapse rate. Having found the air to be reasonably well supplied with thermals of a satisfactory average rate, he must make up his mind to leave his thermals as soon as his rate of climb falls below that average, subject, of course, to maintaining comfortable cruising height.

It will be noticed that throughout this article I have used feet per minute in preference to the more usual feet per second in referring to rates of climb or sink. I have found it easier in practice. It helps considerably in cross-country flying if one takes a knee pad ruled as in Fig. 6. It is then a simple matter to determine immediately after a climb what its average rate has been, and choose the appropriate cruising speed to the next thermal.

THERMALS IN		THERMALS OUT		DATE 23/9/50 A/C GALIN	
TIME	HEIGHT	TIME	HEIGHT	Av. R/C	REMARKS
1240	200	1245	1700	—	ON TOW
1245	1700	1257	3900	183	S. of Radhill
1302	3200	1305	3450	83	E. of Gatwick
1311	2400	1325	3800	100	
1331	2550	1339	3800	156	Nutley-Crowb'ro
1343	3100	1347	3250	37	NE. Uckfield
1349	2900	1350	3000	100	E. "
1357	1800	1406	2900	157	Deanland
1411	1600	1412	1800	200	Old Man
1416	1000	—	—	—	FRISTON.

Fig. 6. Knee-pad ruling for choosing speeds on cross-country flights.

OPERATIONS IN SOUTH-EAST ASIA

H.M. STATIONERY OFFICE has published a despatch to the Secretary of State for Air, on November 16th, 1945, from Air Chief Marshal Sir Keith Park, K.C.B., K.B.E., M.C., D.F.C., Allied Air Commander-in-Chief, Air Command, South East Asia. It is entitled *Air Operations in South East Asia from 1st June, 1944, to the Occupation of Rangoon, 2nd May, 1945*, and appears as a supplement to the *London Gazette*. A set of maps is on separate sale at 1s net.

During the period reviewed a "fanatical and over-confident" enemy was driven back from his foothold in India at Imphal over 800 miles. His field army was completely routed in the open plains of Burma and the campaign culminated in the occupation of Rangoon by our forces on May 3rd, 1945.

A Sturgeon T.T.2 engaged on deck-landing trials. The Sturgeon's agreeable handling qualities were remarked upon in our "In the Air" appreciation on April 20th.

NAVAL TARGET TUG

Operational Technique for the Carrier-Borne Short Sturgeon T.T.2

WHEN "In the Air" impressions of the Short Sturgeon T.T.2 target-tug were given in our issue of April 20th it was not possible to deal with the special characteristics and operating techniques which fit the machine so admirably for its task. This information may now be added.

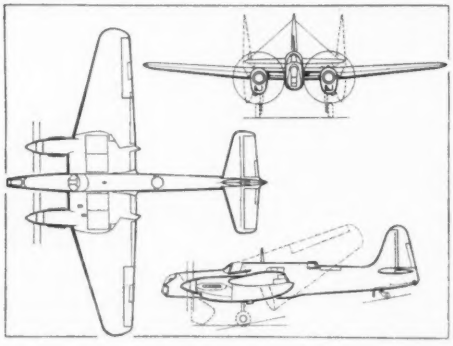
The requirement for the Sturgeon target-tug originated with the end of the last war. It was considered that a high-performance, carrier-borne tug would enable Naval gunners to maintain a high standard of marksmanship—not only ship-to-air, but air-to-air also—throughout the longest cruise, and that, at comparatively low cost, the fleets could be maintained at a higher standard of fighting efficiency than would otherwise be possible. And so the Mk 2 Sturgeon was developed from the Mk 1 reconnaissance bomber. It is capable of undertaking target-towing for ground-to-air firing practice; photographic marking; target-towing for air-to-air firing practice by day or night; "throw-off" target practice and marking; and radar calibration.

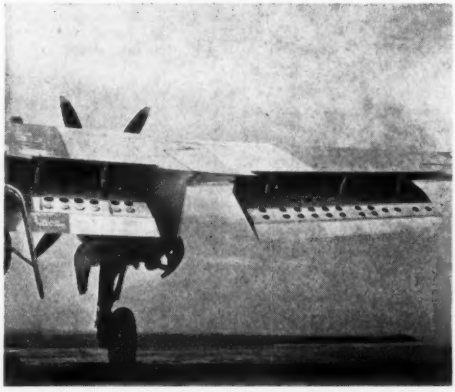
The only control in the pilot's cockpit associated with target-towing is the emergency cable-cutter. With a 2ft or 4ft low-drag sleeve target the maximum speed for launching is 120 kt; for reeling out, 130 kt; for reeling in a 2ft sleeve, 125-130 kt; for a 4ft sleeve, 105 kt. When launching and reeling in the targets, engine r.p.m. should be at least 2,400 (max. permissible r.p.m. is 3,000) to provide adequate hydraulic power to operate the winch.

With a 2ft sleeve the maximum attainable and permissible speed at 15,000ft is 285 kt, and at 5,000ft, 260 kt. Corresponding figures for a 4ft sleeve are 250 kt in each case.

With a sleeve in tow the Sturgeon handles normally. Turns, however, should be restricted to Rate 2, to avoid fouling the cable, and climbs and dives should be shallow.

Handling procedure with a 32ft winged target is as follows: When the target has been secured the engines are cleared and the aircraft taxied slowly forward, as directed by the marshaller, in order to take up the slack in the towing cable and to align the aircraft for take-off. The normal length of cable for take-off is 350ft—that is "short tow". The pilot then checks "all clear for take-off" with the winch operator, and makes a normal full-power take-off. After unsticking at about 85 kt, the aircraft is held down until speed has built up to 110 kt. At this speed initial climb is commenced and the power settings are reduced to +12lb boost and 2,850 r.p.m. Once the aircraft is climbing away, speed should be increased to 120 kt and a sustained climb made to 500ft, to get the target clear of obstacles. If engine failure occurs on the climb the winch operator should be ordered to cut the target adrift.





To permit the wings to be folded, the Sturgeon's hydraulically operated flaps are built in four portions. As will be seen, they are of generous area.

Recommended speeds are: reeling out, 130 kt; reeling in, initially 100-105 kt, then 110 kt once the winch is operating satisfactorily. With the 32ft target, recommended climbing speed is 130 kt. On a 6,000ft tow-length the maximum speed attainable in level flight at 15,000ft is about 230 kt (185 kt indicated); below 15,000ft higher indicated air speeds are attainable, but the maximum permissible I.A.S. is 200 kt. If the winged target becomes very unstable it is cut adrift, if possible over a safe area.

In landing the target it is recommended that the pilot be assisted by a ground controller who will pass instructions by R/T. As the airfield is approached the QNH and airfield height are checked and speed is reduced to 100 kt. The flaps are lowered fully. A long, straight approach is made from 800ft, the rate of descent being regulated in accordance with the controller's instructions. The boundary is crossed at about 300ft and the descent continued until the target is released.

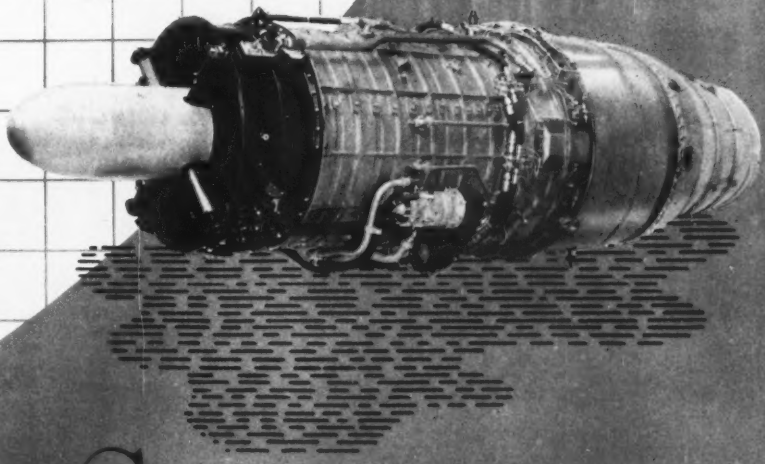
It is necessary for the pilot to react promptly to instructions and the controller should try to anticipate his requirements, due to the appreciable lag in the response of the target. The target should release automatically when it touches the runway; if it fails to do so the winch operator must cut the cable immediately the controller orders him to do so.

ARMSTRONG SIDDELEY GAS TURBINE DEVELOPMENT

low specific weight

7,200 lb thrust for 2,500 lb net dry weight

equals a specific weight of 0·347 lb/lb thrust



Armstrong Siddeley

Sapphire

POWER / PERFORMANCE

ALREADY 7,200 lb THRUST

ARMSTRONG SIDDELEY MOTORS LIMITED, COVENTRY. Members of the Hawker Siddeley Group

114 orbits round the Sun

The hours flown by de Havilland propellers in commercial operation since the war add up to more than 114 Earth years

DE HAVILLAND PROPELLERS

DE HAVILLAND PROPELLERS LTD., HATFIELD AND BOLTON, ENGLAND

The two types of Percival P. 56 basic trainer: The external differences between the Cheetah-powered Mk 1 and the Leonides-powered Mk 2 (in foreground) lie chiefly in the cowling lines.

PERCIVAL P. 56

Design Analysis of the New Basic Trainer Adopted for the Royal Air Force

IN these days of mechanical and physical complexity, when virtually everything embraced in the aviation field is a badge of progress to mark man's technical advance, the production of a mere training aircraft would seem to be a matter of no great difficulty. To some extent, of course, this is so, but before an aircraft can be produced it is essential that some clear idea should exist as to the precise functions it will be called upon to fulfil. The flying training policy of the Royal Air Force has, naturally enough, been subjected to periodic modification during the past few years; and the Percival Prentice can be regarded as a transition between the light-aircraft category of the *ab initio* trainer as exemplified for so long by the Tiger Moth, and the higher-powered, heavier and more advanced type of basic trainer, such as the P. 56.

Percival Aircraft, Ltd., foresaw that an advance over the Prentice would naturally come into its own eventually, and they set about producing a design study for such a type. To this extent the company's prescience must be recognized, for when the Air Ministry issued the specification for a new basic trainer, it might almost have been framed with the design study in mind. Over 30 designs to the specification were submitted by various manufacturers, and from these, two companies—one of them Percivals—were selected to build prototypes to their individual designs. Thereafter, the prototypes competed with each other in an extensive series of comparative trials, as a result of which the P. 56 was chosen, and the decision taken to put the aircraft into quantity production as the standard basic trainer for the Royal Air Force.

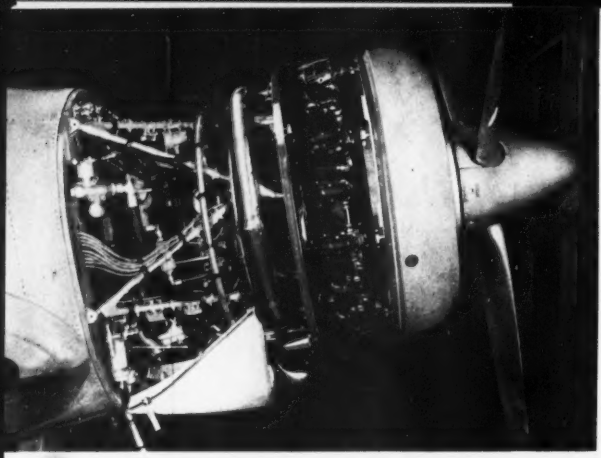
It is apposite here to dilate briefly on the *raison d'être* of the new basic trainer as a type. Fundamentally, it is clearly a reflection of the advances which have been made in operational aircraft during the past decade, the gap between the traditional *ab initio* trainer and the operational types having grown steadily wider. Advanced training aircraft today have features and performance which, a few years ago, would have been found only in a first-line fighter and, therefore, the present-day *ab initio* trainer of necessity must move farther up the scale in order that transition from it to the advanced trainer does not present too much of a chasm for the leaping powers of the pupil pilot.

The comprehensively equipped basic trainer—of which the Percival Prentice may be regarded as the forerunner—can, with its radio aids, give the pupil many more useful flying hours in all weathers than could the time-honoured elementary types which, since 1947, it has replaced. As a result, the number of hours required on the advanced trainer types have been reduced. In this context, whereas the maximum number of useful hours on the original *ab initio* type was found to be about 60, leaving some 140 hours for the advanced trainer stage, the Prentice has changed this ratio to 100 hours in each stage. Extending the example, it is only to be expected that the new P. 56, with its additional power and consequent much-improved performance will, as the successor to the Prentice, take over an even greater share of the training syllabus. Advanced trainers—which are by no means cheap to operate—will then need to be used only for a relatively short conversion stage to accustom the pupil to high-performance aircraft and to the use of weapons.

Two versions of the P. 56 exist, the Mk 1, which is powered by a 420 h.p. Armstrong Siddeley Cheetah 18, and the Mk 2, with a 550 h.p. Alvis Leonides 25. Beyond these differences of power installation, the aircraft are structurally entirely similar, although, as is only to be expected in view of the increase of power available, the Mk 2 has considerably the better performance. It is possible that the first production batch of aircraft will be Cheetah-powered; but because the Mk 2 version will be the standard aircraft delivered to Flying Training Command, it is with this model of the P. 56 that we shall concern ourselves in this analysis.

The power installation is of interest on two main counts, (a) engine cowling, and (b) engine mounting. In order to conform with the classic Stoutian exhortation to "simplicate and add more lightness," the Leonides cowling is of ducted type, the outlet orifices at the port and starboard trailing flanks of the cowling being fixed, so that the pupil pilot is relieved from operating such complexities as variable outlet shutters, or gills, and, of course, the constructors need not provide them. If the tropical trials of the aircraft prove that the cylinder-head temperatures can be kept down to acceptable limits, it will say a great deal for the design quality both of the engine and the cowling system.

The engine mounting arrangement adopted is the result of a decision recently taken by the Service that a reversion to the practice of changing the bare engine should become the standard procedure in place of changing the power-plant as a whole, the latter practice having been found to be uneconomical. To this end, the engine is carried on a tubular-steel triangulated truss-mounting with four attachment points at the firewall, connection between engine and mounting being made through nine dynafocal-type pick-ups between the crankcase and the engine mounting ring. The top-centre and the side apices of the mounting triangulations are fashioned as truncated-cone/socket fittings, which are drawn up with through-bolts. The two bottom tubes of the



The Leonides power installation is particularly neat and offers an unusual degree of accessibility. The bare engine is easily removable as a unit.

PERCIVAL P. 56 . . .

mounting terminate forward in ball ends which marry with sockets on the engine ring and are locked by cup-nuts enclosing the balls and screwing over the sockets.

Carried direct on the back of the Leonides crankcase in the top-centre position is a Newton 1,500-watt generator, beneath and behind which is a direct-mounted direct-driven Rotol gearbox carrying a Hymatic 1,000 lb/sq in compressor, a Plessey vacuum pump and a Rotax starter; the tachometer generator is provided with a direct drive off the engine. Induction through the medium of a Hobson fuel-metering injector unit has proved to be remarkably efficient, and it is noteworthy in this connection that, *vis-à-vis* the Mk 1, the Mk 2 has an economical-cruising specific-consumption of 1.5 gall/hr less, so giving 30 minutes greater duration and 93 nautical miles greater range; moreover, it provides these advantages in conjunction with an increase in (economical cruising) speed of eight knots.

Reference has already been made to the ducted cowling which, in addition to possessing the advantage of simplicity and lightness, also inherently provides unbroken cowling lines. A ram intake beneath the cowling gives into an up-draught duct to the fuel injector *via* a Vokes Mille Vee filter. From the air-intake duct is a branch pipe to the oil cooler (by Morris Radiators, Ltd.), the flow from which is exhausted to atmosphere through a pilot-operated flap. The oil tank is mounted to port on the forward face of the firewall, and embodies negative-g compartments, a hot-well, and a de-aeration system. A Purolator filter is introduced into the scavenge circuit, with a Teddington surge valve to protect the cooler from excess pressures. Fuel and oil lines forward of the firewall are Palmer fireproof flexible hose, with the exception of that between the surge valve and the oil tank, which is of Tungum; abaft the firewall, the fuel lines are of light alloy and, from each of the wing tanks, fuel is gravity-fed to a central collector tank. This is a metal, crash-proof-covered unit, located at the base of the firewall on the after-face, and embodies a B.P. Mk 5 submerged booster pump; a micronic-type filter is employed.

From the firewall to the tail fairing, the fuselage structure of the P. 56 presents an excellent example of straightforward, no-nonsense aircraft engineering practice. It is a conventional semi-monocoque, incorporating four quandrantally-disposed longerons and, in common with the remainder of the airframe structure, exhibits traits of strict weight-control, the effectiveness of which can be seen in the value of 31 for the percentage structure-weight. Both pairs of longerons are 14-gauge rolled sections, the upper pair being at canopy-rail height, and the lower pair at cockpit-floor level; the forward terminals of all four longerons are the main pick-up points of the engine mounting. In general, the fuselage skin panelling is carried on Z-section stringers and channel-section frames, many of the latter being doubled, reinforced or increased in gauge at stations where some degree of load concentration occurs. Beneath the floors, diaphragm webs are commonly used in conjunction with the frames to provide transverse bulkheads.

In way of the instrument panel are doubled channel-frames spanned by a tube to which, in common with the longerons, the instrument panel supporting frame is a.v.-mounted. The instruments are grouped on two panels which are centrally hinged to the supporting frame so that ready access is provided to the backs of the instruments.

The P. 56 does not make use of a centre-section in the conventional sense; the wing-spar roots are attached to reinforced bridging members which span the fuselage. In way of the main spar, the bridging structure comprises two machined channel-section forged booms joined by a pair of plate-webs internally stabilized, and so forming a box-beam. In conjunction with this spanning structure is a box frame which runs like an unbroken U from one top longeron to the other, and encloses the ends of the spar bridge beam. The rear spar bridging structure is a simple diaphragm bulkhead, stabilized on its front face with rolled channel verticals, and spanned by horizontal members, the upper of which is a rolled lipped-channel section, whilst the lower is made up by two lipped channels placed back-to-back. The periphery of the diaphragm is bounded by a double-channel frame, and pick-up to the wing rear spars is effected through double plate fittings. Between the spar bridges and riveted to the outside skin of the fuselage belly flank is a 21in-long top-hat-section drag member which, at its forward end, is attached through a channel fish-plate fitting bolted to the rear face of the lower spar-bridge boom.

Fabricated as a sub-assembly complete with longerons, the pilots' floor is made up with light alloy sheeting, supported on fore/aft seat bearers of channel section with angle reinforcement, and laterally between these bearers run channel-section intercostals. The floor extends as a deck between the firewall and the rear bulkhead of the cockpit, and is interrupted only by the top booms of the main spar bridge, which rises 1¼in above floor level. About 55 per cent of the spar inter-distance rearward of the main spar bridge structure is an under-floor double-channel frame, the upper horns of which (immediately beneath the floor) provide pick-up points for the feet of the two forward tubes of the crash-pylon. Above the floor, at the rear spar station, is the cockpit rear bulkhead which, sloped rearward a few degrees, is an integrally swage-stabilized diaphragm, reinforced by diagonal top-hat-section and horizontal angle-section members. At the apex of the top-hat diagonals, on the crown of the bulkhead, is a pick-up fitting for attachment of the foot of the rearward central tube of the crash-pylon. One frame bay abaft the cockpit bulkhead is a structural break in the fuselage which, however, is not a transport joint; the skin panels are lap-jointed, and the longerons are butt-jointed with nesting sections.

From the structural break aft, the fuselage is a continuous structure, skinned on rolled-channel frames, notched for the rolled Z-stringers. The top longerons—although they are cranked—run continuously back to the tailwheel bulkhead,

Easy access to the radio equipment (and batteries) is provided through large hinged panels on the port and starboard sides of the fuselage.

AIRWORK SERVICES

at your service..

Airwork aircraft operate over most of the world, flying personnel, valuable, urgent and perishable cargoes with speed and certainty. Air Transport Contracting is but one aspect of Airwork, the greatest private enterprise air organisation of its kind. Party organisers and leaders frequently find it helpful to consult Airwork.

The photograph below shows a party of British Boy Scouts flown by Airwork Ltd. to Greece by Dakota aircraft.

AIRWORK

LIMITED

services include

Air Transport Contracting • Servicing and Maintenance of Aircraft • Overhaul and Modification of Aircraft • Sale and Purchase of Aircraft • Operation and Management of Flying Schools and Clubs Radio Sales and Service • Insurance

AIRWORK LIMITED · 15 CHESTERFIELD STREET · LONDON, W.1 · TEL: GROSVENOR 4841

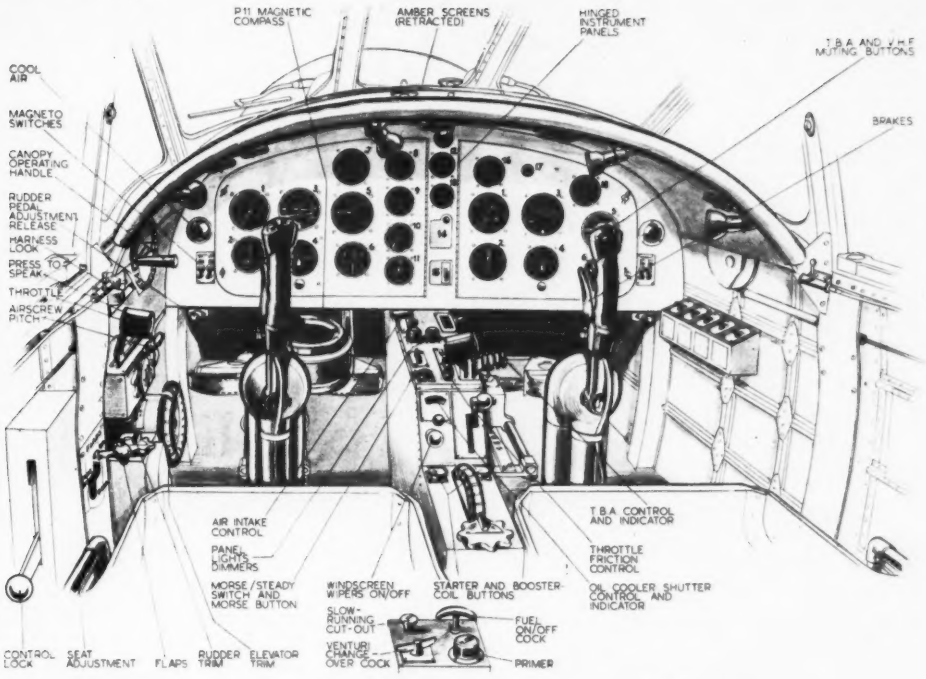
Also at Gatwick Airport, Horley, Surrey. Blackbushe Airport, Nr. Camberley, Surrey. Langley Aerodrome, Bucks. Stansted Aerodrome, Essex. Loughborough Aerodrome, Dishley, Leics. Royal Naval Air Station, Brawdy, Nr. Haverfordwest, Wales. Perth Aerodrome, Perthshire. Usworth Aerodrome, Castletown, Co. Durham.

After competitive trials the Percival "P56" has been selected by the Royal Air Force as their new Basic Training aircraft

Percival "P56" side-by-side two seat Basic Trainers with alternative engine installations. The leading aircraft with the Alvis "Leonides" MK25; the formating aircraft with the Armstrong Siddeley "Cheetah" MK18.

PERCIVAL AIRCRAFT LTD., *LUTON, BEDFORDSHIRE, ENGLAND, and at TORONTO, CANADA.*

A "Hunting Group" Company



1. Air-speed indicator
2. Altimeter
3. Artificial horizon
4. Directional gyro
5. Rate of climb
6. Turn and slip
7. Tachometer
8. Boost
9. Oil temperature
10. Oil pressure
11. Clock
12. Fuel gauge
13. Cylinder-head temperature
14. V.H.F. control
15. Pitot head heat
16. Air-bottle pressure
17. Power-failure warning
18. Vacuum gauge

Having regard to the designed purpose of the aircraft, the cockpit layout leaves nothing to be desired, and this, together with the excellent field of view afforded each pilot, and the generous width at shoulder level, makes it difficult to see where any improvements could be made in the scheme.

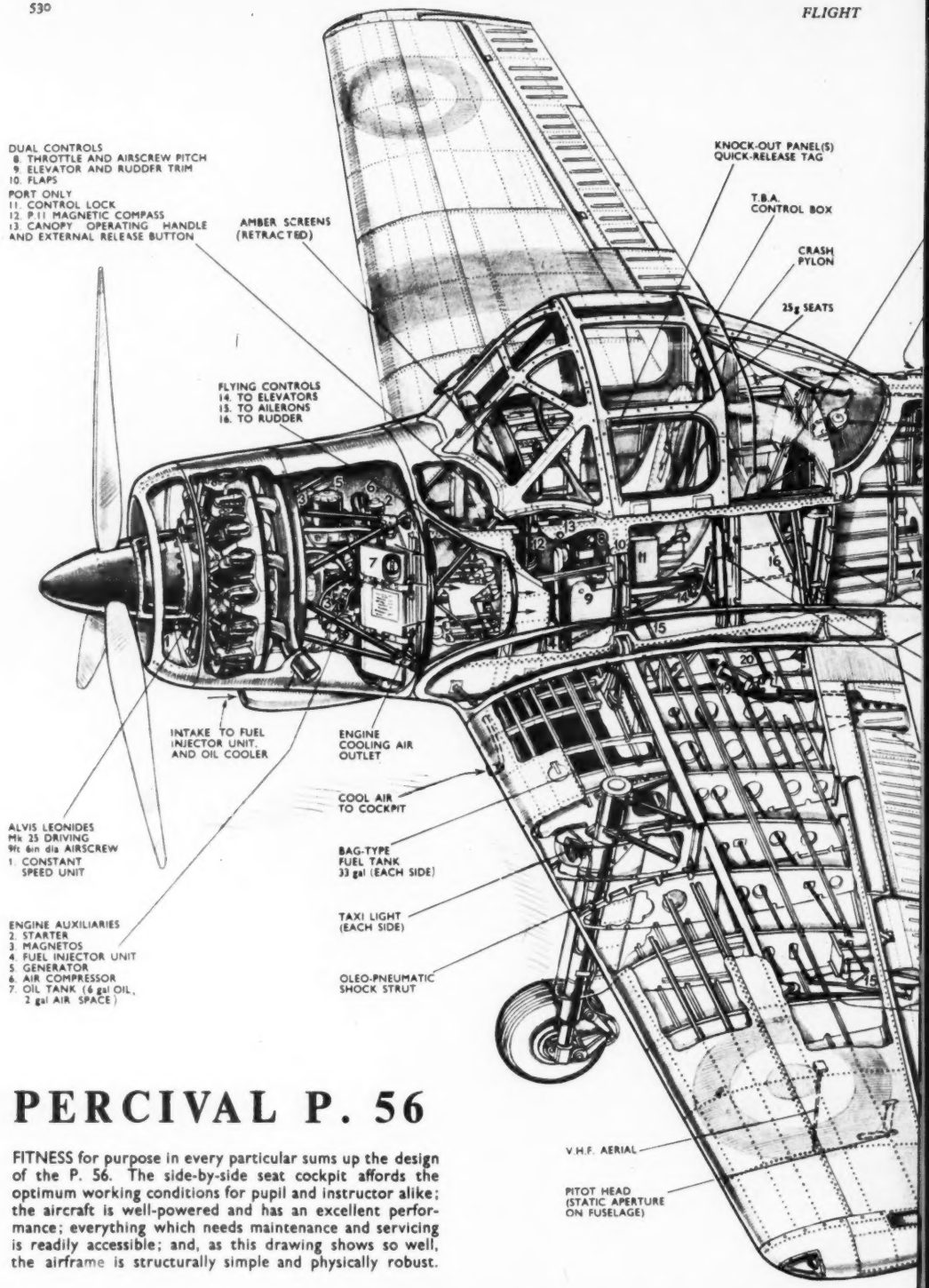
PERCIVAL P. 56 . . .

whereas the lower longerons die out into Z-stringers over a distance of approximately 30in, the transition being complete at about the fin front-attachment station. One frame bay abaft the structural break, at lower longeron level, is a radio and battery support floor which extends 57½in aft. Top-hinged access doors are fitted in each side of the fuselage, that on the port side giving access to the radio equipment, and that on the starboard side giving access to the batteries; both doors are 18.35in long, and about 13in high.

The front attachment of the fin is made through a plate fitting, bolted to the deepened crown of a normal fuselage frame; but, at the rear of the fin, attachment is made at two machined lug forgings, bolted to the head of a diaphragm bulkhead spanning the whole cross-sectional area. This bulkhead serves as a supporting medium for the control transmission linkages to the tail surfaces. Immediately abaft this bulkhead, the fuselage topsides are cut-away for accommodation of the tailplane, and are bridged by a light-alloy sheet decking. Embodied in this tail decking is the supporting structure for the foot of the rudder post, immediately rearward of which a pair of machined, forged fork fittings for tailplane front attachment project up through the decking from a box frame by means of which some of the tailplane loads are distributed. The tailplane rear attachment is made through machined, forged lug fittings, bolted to the head of a diaphragm which is, in fact, the tail end-wall of the rear fuselage proper. On the rear face of this bulkhead is carried the tailwheel assembly, mounted in a light alloy casting, bolted to the diaphragm bounding frame. The tail extremity of the fuselage is wedge shaped, and takes the form of a light, removable fairing.

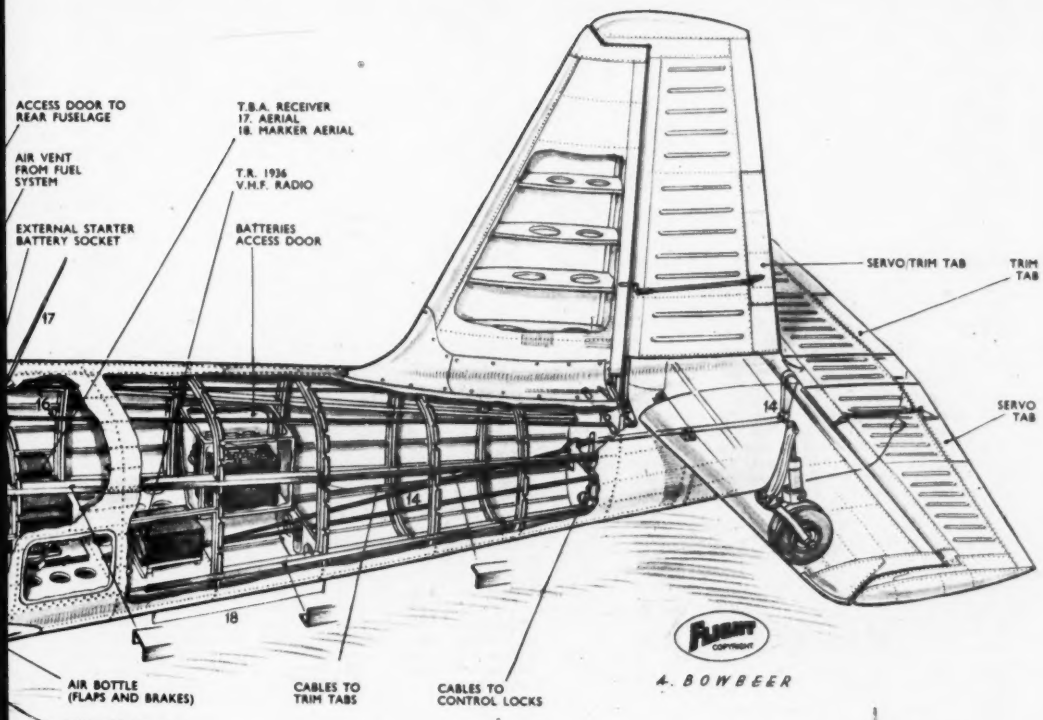
Before leaving the fuselage to examine the wings and tail surfaces, some attention must be accorded to the cockpit. This is of frankly generous size, the width being no less than 45in. The accompanying detail drawing gives an excellent illustration of the instrumentation and the disposition of controls, but mention must be made of one or two other points. The rudder pedals, which are assemblies of Percival design, move with a parallel-action, and are spring-loaded for adjustment; the pilot pulls a knob, pushes the pedals to suit his leg length, and, on his releasing the knob, the pedals are automatically set for his comfort. Another ingenious feature is the seat mounting. Standard S.B.A.C. bucket seats are used, but each is mounted on a cradle from the four corners of which lugs extend down and are pin-jointed to quadrants. The front quadrants have their arcs drilled for engagement by spring-loaded pins, whilst the rear quadrants are spanned by a torque tube from which depends a horn arm attached to one end of a length of elastic cord, the opposite end of which is anchored; front and rear quadrants are linked by fore-and-aft tubes. Outboard of each seat is a fixed hand-grip, in which is incorporated a slide-grip whereby, by a Bowden cable, the spring-loaded pins can be released from engagement with the quadrants. Tension in the elastic acts against the

(continued on p. 532, after cut-away drawing of the P. 56)

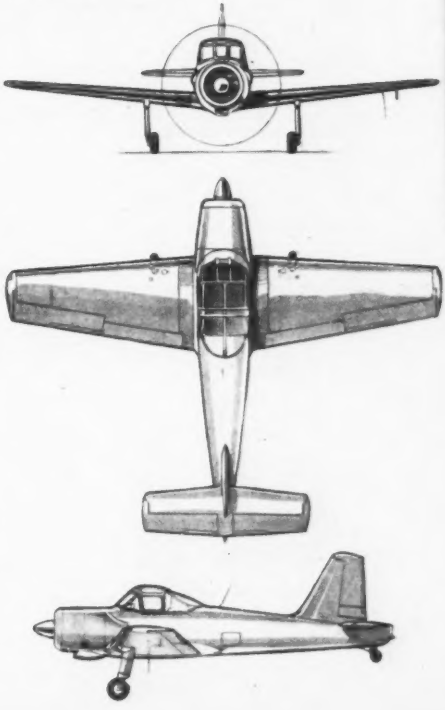


PERCIVAL P. 56

FITNESS for purpose in every particular sums up the design of the P. 56. The side-by-side seat cockpit affords the optimum working conditions for pupil and instructor alike; the aircraft is well-powered and has an excellent performance; everything which needs maintenance and servicing is readily accessible; and, as this drawing shows so well, the airframe is structurally simple and physically robust.



4. BOWBEER



PERCIVAL P. 56 Mk 2 DATA

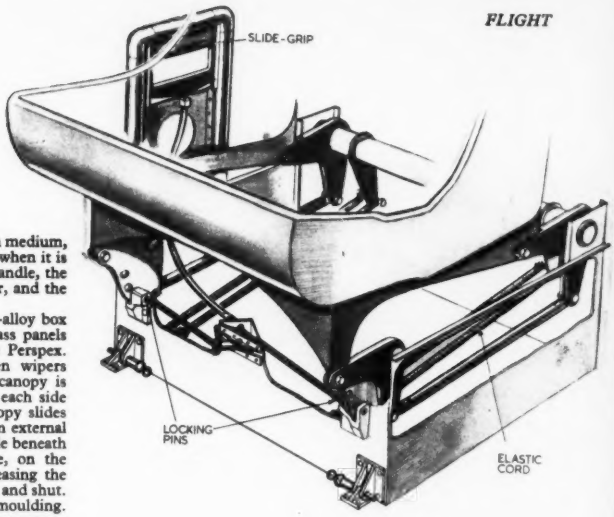
Alvis Leonides 25 air-cooled engine of 550 b.h.p. driving a 9ft 6in dia. 3-blade c.s. metal airscrew

Span	35ft 2in
Length	29ft
Height (tail down)	8ft 10¼in
Ground angle	9 deg 30 min
Wheelbase	20ft 9¼in
Track	11ft 1¼in
Wing area	214 sq ft
Aspect ratio	5.78
Aerofoil section:—	
root	NACA 23015 (mod.)
tip	NACA 4412 (mod.)
Dihedral	6 deg
Incidence	3 deg
Tailplane span	13ft 6in
Tailplane and elevator area	48.6 sq ft
Fin and rudder area	35.09 sq ft
Flap area	9.47 sq ft
Gross weight	4,250 lb
Wing loading	19.85 lb/sq ft
Power loading (take-off)	7.7 lb/h.p.

Performance

Max speed (sea level)	173 kt
Max speed (5,000ft)	174 kt
Max continuous cruising speed (2,000ft)	155 kt
Max w.m. cruising speed (5,000ft)	141 kt
Stalling speed (flaps down)	58 kt
Initial rate of climb	2,200ft/min
Time to 5,000ft	3.3 min
Time to 10,000ft	6.5 min
Service ceiling	25,000ft
Take-off to 50 ft (still air, grass surface)	290 yd

PERCIVAL P. 56 . . .



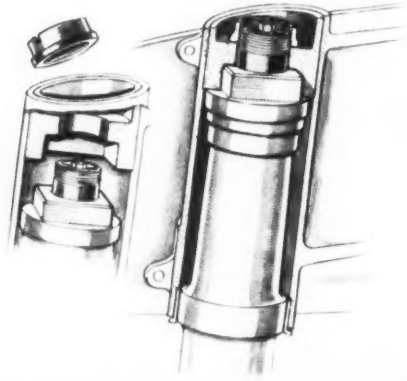
Detail of seat mounting, showing the ingenious yet very simple method of effecting height adjustment.

weight of the pilot, and the hand-grip is purely a reaction medium, whereby the pilot can push his seat up or pull it down; when it is adjusted to his liking, he releases the slide grip in the handle, the pins engage the quadrant holes with which they register, and the seat is then locked.

The windscreen assembly is framed in built-up light-alloy box sections, and is glazed with 3/16in-thick toughened glass panels with the exception of the top brow lights, which are Perspex. A pair of Dunlop pneumatically actuated windscreen wipers sweep the front screens. The sliding portion of the canopy is glazed in Perspex, and embodies knock-out panels on each side retained in Claytonrite rubber-strip framing. The canopy slides on two ball-race rollers port and starboard, which run in external guide rails, and is wound open and shut by a crank handle beneath the port bow screen. Complementary to the handle, on the outside of the fuselage, is a flush press-button for releasing the winding gear, so permitting the canopy to be pulled open and shut. The rear canopy fairing is a well-shaped, fixed, Perspex moulding. To permit blind-flying instruction, amber-dyed Perspex screens are used in conjunction with blue goggles worn by the pupil pilot. The amber front-screen is a single, curved sheet of Perspex, which extends over the whole of the windscreen assembly interior surface and, when not in use, is housed in a slot in the scuttle. From this position, it is manually raised, and is locked at top-centre to the screen framing. Amber screens on the side panels of the sliding canopy are permanent fixtures, which are merely slid rearward when not required. As may be gathered from the illustrations of the aircraft, the all-round field of view from the cockpit is extremely good—this despite the fact that the thrust line of the Leonides engine is some 7in higher than that of the Cheetah installation in order to accommodate the larger airscrew used, and despite the fact that the pilots sit more or less over the (chordal) centre of the wing.

The modest aspect-ratio and wing loading of the P. 56—coupled, of course, with its generous power loading—are undoubtedly responsible for the nimble flying characteristics. The aerofoil is a modified N.A.C.A. section with what can best be described as a "droop-snoot" leading edge. This, of course, has nothing to do with flying at high Mach numbers; it is, on the contrary, an aerodynamic resort to increase "spinability." The wings are each built up on a main spar at approximately the maximum depth ordinate of the section, the spar from the wing-root out to roughly semi-span being a conventional fabrication of plate-web and taper-machined forged booms. From the semi-span out to the tip, the forged booms give way to rolled, lipped Z-section members. The spar web is in three spanwise sections, respectively of 18, 22 and 24 s.w.g. plating. The rear spar, from root to tip, is a tapered channel-section member, of 20 and 22 gauge, with a 16-gauge reinforcing plate extending from the root approximately 3ft outboard. The web is integrally swage-stabilized and, in common with the main spar, has Z-section verticals for rib attachment. Chordal ribs are plate diaphragms, with swaged lightening holes, and are notched for the spanwise stringers; three of these are top-hat-section (two forward and one behind the main spar) which taper out to Z sections beyond the semi-span, all other stringers being Z-section members. At aileron- and flap-hinge stations, the chordal rib webs are reinforced with lipped-angle members running over the stringer crowns. The wings are skinned with 24-gauge D.T.D. 610 dural panels, with the exception of the undercarriage bay, which is skinned in 22-gauge, all panels being lap-jointed. A 20-gauge reinforcing plate is fitted under the wing skin panelling top and bottom in way of the root ends of the main spar. High-tensile steel pins of 1¼in diameter join the main spare to the transverse member bridging the fuselage, the top pins being horizontal, and the bottom pins vertical; at the rear spar a single, horizontal pin is used.

As shown in this part-sectional view, anchorage of the main undercarriage legs is effected in a particularly simple yet entirely practicable manner.



The fixed main undercarriage legs are British Messier telescopic oleo-pneumatic struts, with scissor torque-links and cantilever axles. The legs themselves are cantilevers in D.T.D. 721 magnesium-alloy castings of ingenious design. These castings are in the form of cylinders, in the bores of which the heads of the undercarriage legs register, the crown of each leg being formed as a square boss which engages a square hole in the head-plug of the cast cylinder. A threaded spigot (through which the oleo strut is filled) rises from the centre of the square boss and the leg is retained in its cylindrical housing by a nut screwed on the spigot and bearing down on the head-plug of the cylinder. Integral brackets on the sleeve casting serve as attachment points for a diagonal bracing structure which runs back to the junction of the main spar and the outboard rib of the undercarriage bay.

Inboard of each undercarriage, the wing leading edge is given over to accommodation of the 33-gallon bag-type fuel tanks by Fireproof Tanks, Ltd., and both tanks are fitted with Heston filler caps. These cleverly designed units comprise a frame bolted both to the tank and to the wing skin, and inside this frame the filler cap forms a flush surface for wing-skin continuity. The cap incorporates a flush-type toggle fastener, and seals direct to an internal rubber annulus in the filler frame.

Ailerons are horn-balance surfaces, the horn serving to accommodate a mass-balance. They are built with a 24-gauge D-nose on a pressed channel spar and, abaft the spar, are skinned with integrally swage-stabilized 26-gauge panels to a channel-section trailing-edge spar. Each aileron is furnished with a servo balance-tab immediately inboard of which is fitted a ground-setting tab, and both main surfaces are swung on two hinges. Off the rear spar of the wing are box-brackets of truncated form, in the crowns of which screwed bushes are fitted. Yoke trunnion fittings are bolted to the screwed bushes, the axes of which are vertical; by this means, the aileron hinge axis can be adjusted for height, the hinge proper being a self-aligning ball bearing at the tip of each yoke trunnion.

Structurally, the slotted flaps are essentially similar to the ailerons in having pressed channel spars and a D-nose of 24 gauge, with integrally swage-stabilized 26-gauge skin abaft the spar. The slotted flaps are each swung on two hinges the axes of which are roughly 2½in below the flap under-surface and about 5in abaft

At the upper left corner of this bag-type fuel cell (Fireproof Tanks, Ltd.) can be seen the particularly neat flush-fitting Heston filler cap.

Each undercarriage strut is trousered with a toggle-fastened streamlined fairing in the head of which is very neatly fitted a taxying light.

the leading edge. The hinge brackets are D.T.D. 721 magnesium-alloy castings, bolted to the wing rear spar, and the flap leading-edge nose seals against a synthetic rubber strip fitted along the lower edge of the wing/flap cut-out. Flap control is pneumatic and both surfaces are jointly actuated by one double-acting duplex ram arranged diagonally in the trailing-edge root of the port wing. The ram is carried off a trunnion supported in brackets on the root rib, and picks-up to a light alloy cast bell-crank with wide-based bearings on a vertical axle, cantilevered off a box-bracket bridging the root rib bay. A push-pull tube transmits motion from the bell-crank direct to the port flap, and a transverse system of push-pull tubes on three swinging slave-links (all with self-aligning ball bearings) bridges the fuselage and connects the bell-crank to a similar unit in the starboard wing root, from which another push-pull tube runs direct to the starboard flap. From the "up" position, the ram half extends to lower the flaps to the "take-off" setting, and extends fully to lower the flaps to their maximum incidence for landing. The control transmission for the ailerons, in common with that for the rudder and elevators, is by means of tie-rods and cables.

The fin is built up on a pressed-channel leading-edge spar, forward of which is a D-nose of 24-gauge plating. The main spar (or rear post) is formed with a plate web and lipped-angle booms with nesting reinforcement. Chordal ribs are pressed-channel diaphragms with swaged lightening holes, and the fin is clad with 24-gauge skin panelling. The rudder has a pressed-channel leading-edge spar, with a single wrapped-skin 24-gauge D-nose. The integrally swage-stabilized skin panels are 26 gauge and are attached to a pair of Z-stringers and five chordal ribs, each of which is a pressed diaphragm with lightening holes. The trailing-edge spar is a pressed channel, and the rudder is horn-balanced with a mass in the horn tip. The base of the rudder trailing-edge accommodates a 20in by 4in tab, which serves not only as a balancing servo but as a trimming surface as well.

The tailplane is a straight-through structure with parallel spars of pressed-channel section, reinforced with lipped angles, and the web of the front spar is pierced by lightening holes. The chordal ribs are pressed diaphragms, notched for the Z- and top-hat stringers. In common with the fin, the tailplane has a 24-gauge D-nose leading edge, and the top and bottom inter-spar skin panelling is also of 24 gauge, with the exception of the centre (attachment) bay, where the D-nose is cut-away, and the skin panelling is 22 gauge. Structurally, the elevator is essentially similar to the rudder.

Although, as was mentioned in the beginning of this article, the P.56 to all intents and purposes existed as a design study prior to the framing of the official specification, it is perhaps by quoting in broad terms the requirements expressed by the specification that the essential characteristics of the aircraft can best be summarized. A good initial rate-of-climb, and short time-to-height were called for, in order that time should not be wasted in getting up to and recovering aerobatic height; with this a useful endurance was demanded, so that maximum instructional time could be utilized. These considerations dominated the maximum speed requirement. Naturally enough, the aircraft was required to have first-rate manoeuvrability and response characteristics of a straightforward and uncomplicated kind, and it was essential that, together with reasonable stall warning, the aircraft should also possess good stalling and spin recovery characteristics. Having made this summary, it remains only to be said that the Boscombe Down report on the aircraft was such as to be fairly described as eulogistic, the rate of roll (about 90 deg/sec) and the aileron response, in particular, being extraordinarily good.

In the P. 56, therefore, it would seem that the Royal Air Force can look forward to having a basic trainer which, for its designed sphere, is without doubt at the moment unrivalled. Percival Aircraft, Ltd., are therefore to be congratulated on having done a very fine job.

C.B.B-W.

FORTHCOMING EVENTS

May	5.	Roborough (Plymouth) Air Display.
May	5-8.	Foire de Paris Rally, Toussus-le-Noble.
May	6.	R.Ae.S.: Garden Party, White Waltham.
May	12-14.	Aero-Club de France: Champagne Rally.
May	13-14.	S.M.A.E. International Model Competitions.
May	14.	S.S.A.F.A.: Air Display, Hucknall Notts.
May	19.	Derby Aero Club: "At Home" and Flying Display.
May	19.	Helicopter Association: Annual General Meeting.
May	20.	Kent Coast Flying Club: "At Home" (sponsored by A.B.A.C.).
May	26.	Newcastle-on-Tyne Air Display.
May	26.	Wolverhampton Aero Club: Goodyear Trophy Race.
June	2-4.	Yorkshire Aeroplane Club: International Rally.
June	2.	Auster Flying Club: Rally, Rearsby.
June	3.	Auster-Ragosine Homing Trophy, Rearsby.
June	8-10.	Air Circuit of Sicily.
June	9.	Rally and Race, Fairwood Common Aerodrome, Swansea.
June	9-10.	Royal Air Forces Association: Annual Conference, Torquay.
June	10.	Lancashire Aero Club: "At Home" (sponsored by A.B.A.C.).
June	15-18.	Royal Danish Aero Club: International Rally.
June	15-	Paris Aero Show.
July	1.	
June	23.	R.Ae.C.: Festival of Britain National Air Races, Hatfield.
June	24.	International Rally, Pisa, Italy.
June	27-28.	Institute of the Aeronautical Sciences: Annual Summer Meeting, Los Angles.
June	30-	Cognac International Rally, France.
July	1.	
June	30-	R.Ae.C.: Members' Deauville Rally.
July	2.	
July	1.	International Rally, Savona, Italy.
July	4-11.	F.A.I. Committee Meetings, Brussels.
July	7.	S.S.A.F.A.: Air Display, Prestwick.
July	7.	Aero-Club de Savoie: International Rally, Aix-les-Bains, France.
July	7-8.	R.Ae.C.: Members' La Baule Rally.
July	7-8.	International Wakefield Cup Model Contests, Finland.
July	14.	Bristol Corporation: Air Race Meeting.
July	14.	S.M.A.E. Festival of Britain Model Championships, Wembley.

The New Armament : An Explanatory Survey of Present and Future Applications

By . . . KENNETH W. GATLAND

THIS is the first of a series of articles, the purpose of which is to outline some of the present and future applications for guided missiles, firstly both as defensive and offensive armament, and secondly as instruments of research into the upper atmosphere and outer space. The author is a founder member of the British Interplanetary Society, and occupies a post in the Hawker design department.

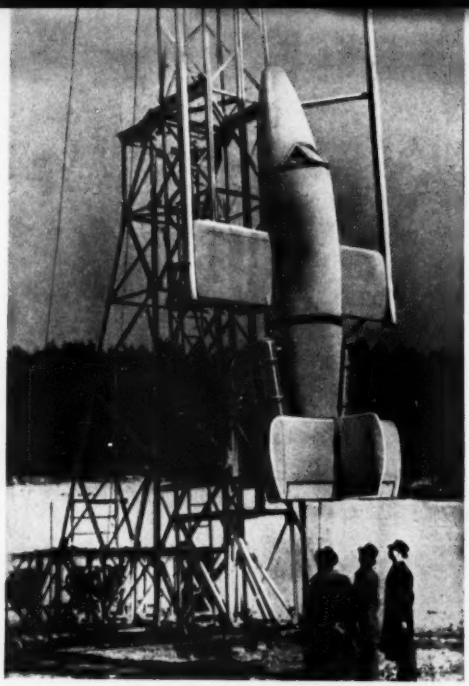


Fig. 1. The German Ba carried 33 rocket projectiles in the nose, took off from a vertical ramp, and climbed at 35,800ft/min. It was intended to be piloted.

Evolution of the Guided Missile

TO be strictly accurate, a guided missile is a space-traversing vehicle capable of changing its flight path under the influence of an *outside* controller, but it will be convenient here to take the broad definition and include also the type that employs purely automatic controls, for example the self-homing anti-aircraft missile and the V.2-type long-range rocket.

One of the most urgent aspects of guided-missile research now engaging all the major world powers is that of defence against the jet bomber. One school of thought suggests that the best chance of reaching and returning from an objective lies in the unarmed bomber designed for extreme height and speed. In the conception of our advanced jet bombers, we have come to think in terms of speeds in the region of 550-600 m.p.h., and operating altitudes of between 40,000 and 60,000ft.

There are two methods to consider for the interception of such aircraft : (a) the fast-climbing jet- or rocket-propelled fighter, using conventional fire-power, and possibly unguided or guided air-to-air rockets, and (b) the ground-launched guided missile. The guided missile is the new, powerful, anti-aircraft weapon and since we cannot expect the effective range of the A.A. shell greatly to exceed 35,000ft, the introduction of the guided missile is a matter of the utmost urgency.

Economically, in consideration of the missile's complexity and high individual cost, it appears at first sight to be a poor substitute for the ordinary anti-aircraft shell. The shell is simple, cheap and reliable and lends itself to a high volume of fire, but when it is realized that the German heavy artillery averaged only one Allied aircraft destroyed in 50,000 shells fired, then the guided weapon assumes more practical significance, even in a straight contest with A.A. fire, below 35,000ft.* Moreover, it places before us an entirely new conception in the manufacture of A.A. weapons.

Specialized heavy machinery and plant required in the production of guns and shells, necessarily located in large industrial centres, are eliminated, for the guided missile is essentially the product of light engineering and, as the Germans were swift to realize, its manufacture can conveniently be spread over a whole range of industries. This is particularly valuable from the viewpoint of industrial deployment, for whilst research and development are carried

** If, however, wars were fought on a cost basis, one might be impressed by an American estimate that, using the Boeing GAPA rocket, the cost of defending a city the size of Washington would be $40 millions to destroy 250 bombers, or $100 millions to counter a 1,000-bomber raid.*

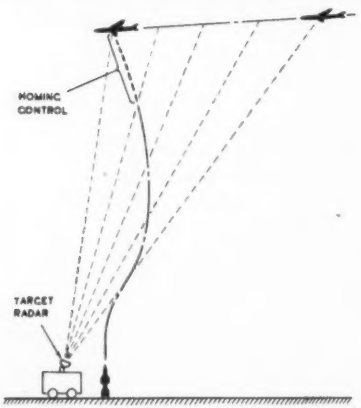
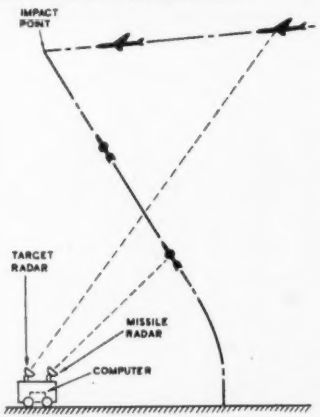


Fig. 2. (Left) With the Beam-Rider control system, the attacking missile climbs within the cone of a radar beam which tracks the target.

Fig. 3. (Right) In the Command-Guidance system, one radar tracks the target, whilst the other tracks the missile, and each feed data into a computer, whereby steering commands are transmitted to the missile.



SELECTED AS THE NEW BASIC TRAINER FOR THE ROYAL AIR FORCE

"Aeroplane" Photograph

The Percival P.56 trainer fitted with the Alvis Leonides engine

ALVIS

LEONIDES

ALVIS LIMITED, COVENTRY, ENGLAND

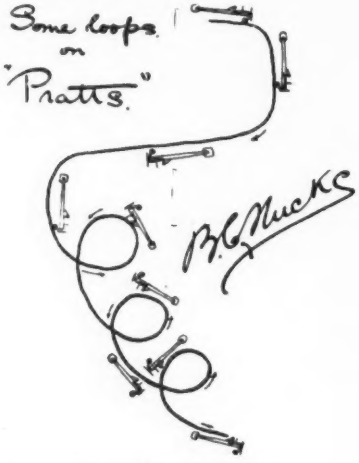
It pays to say . . .

WHEN fame and fortune rewarded the flyers of Kitty Hawk, Wilbur and Orville kept their heads. The Wright Brothers were singularly and dually unimpressed, John Dos Passos has told us, " by the upholstery and the braid and the gold medals and the parades of plush horses." They remained humble mechanics ; they serviced their machines with their own hands—" even to filling the gasolene tank."

Wise men.

In those days even the ESSO service (yes, the Wrights used the products of ESSO's forebears) was somewhat sketchy and . . . well, a trifle gimcrack. But that was 1903.

Remember pre-1914 Hendon ? B. C. Hucks ? Below is his own diagram of loops done on Pratts—ESSO's godparents in Great Britain—reproduced from an advertisement in " The Aeroplane " of December 18th, 1913. Bunting a Blériot ! Ugh ! !



Now turn to the twenties and thirties.

Giant strides ? Yes and no. Croydon was then Britain's one and only international airport, and the refuelling service at Croydon consisted of two men, a dog and a battery of the familiar road-side petrol pumps. At smaller aerodromes the two-gallon tin and funnel was still the standard refuelling equipment. The day of *intensive* development had not yet arrived.

But *extensively* there was much ado. New airfields were appearing every week. The Hinklers, Scotts and Blacks, Earharts, Lindberghs, Kingsford Smiths were touching down here, there and anywhere ; and wherever they landed they expected to find fuel ready and waiting. Yes, the refuellers beat the flyers to Conakry, Ouagadougou, Yoff, Zinder, Usumbura, Windhoek, Ratmalana, Kai Tak, Dum Dum, Kuching, Lakunai, Darwin, Garbutt. . . . They had to ; *had* to.

And it wasn't always easy. Isn't even now. In the Sahara fuel reaches the landing-grounds by camel ; in the South Seas it goes in by tank-landing craft ; elsewhere it's supplied by pack-horse, by raft, tanker, barge,

tank-car, pipe-line. And not just any old fuel, for even in the remotest airfields air superintendents have a habit of specifying " 80 " or " 100/130 " or " 108/135 " or " 115/145 ", and it's ESSO's job to see that they get it.

It's a biggish job.

Now jump to 1951. The scene : London Airport. Our two men and a dog have become a team of thirty expert refuellers (and a dog) armed with four 3,300-gallon tankers and a new 4,000-gallon unit capable of delivering the goods at more than 300 gallons a minute any time day or night. Petrol plus oil, water-methanol, de-icing fluid, plus . . .

Refuelling in complete safety at top speed—everywhere. That's 1951. Prestwick : twenty minutes scheduled for a re-fill of 2-3,000 gallons. Shannon : 10,283,561 gallons of ESSO piped into 4,883 airliners in one year (eighty per cent. of all aircraft using the airport !) Gander . . . Goose Bay . . . Elmdon, Renfrew, Jersey, Speke, Bovingdon, Croydon, Northolt, Ringway . . . everywhere, it pays to say ESSO.

Last year's deliveries of ESSO aviation fuels to international airlines reached the respectable total of 193,537,134 gallons—enough petrol to push an average British car round the equator 148,875 times, as if you didn't know !

During the Berlin Airlift ESSO supplied 65,000 gallons daily, enough fuel . . . never mind, let's skip it.

It is no secret that ESSO's world-wide service is the product of long experience and indefatigable research—experience won the hard way and paid for by the confidence and co-operation of the pioneers, and research by the boys in the not-so-small back rooms of ESSO's £5,000,000 a year laboratories.

Experience and research of this order add up to something bigger than service—*tradition*. And the ESSO tradition is one good reason why at all times and in all places it pays to say . . .

ESSO

FOR ALL PETROLEUM PRODUCTS

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON

Evolution of the Guided Missile . . .

out at the Guided-Weapons Establishments both in this country and Australia, the actual production of missiles will be in the hands of aircraft firms and associated manufacturers. In time of emergency, all manner of ordinary commercial firms can then be brought into the scheme around this nucleus.

The absence of a dependable guidance system was Germany's chief handicap in the development of her war-time missiles, and several ingenious suggestions were made for side-stepping the long and arduous research that would otherwise have been required to provide a foolproof system of remote control. One of the ideas originated in 1944 to combat our high-flying bombers, for example, was that the intercepting missile should be piloted, which resulted in the development of the Ba 349 Natter (Fig. 1).

The design of this unique intercepter was centred in a vertical take-off and an exceptionally high rate of climb. To satisfy these requirements, it was decided to concentrate on the climb factor and to effect no compromise such as maintaining a reasonable wing-loading for the usual flight manœuvres and landing. The design, in fact, was such that landing by normal means was impossible and it was at first planned to sacrifice the complete aircraft. The latter problem was overcome by arranging that the pilot abandoned the machine after pressing home the attack and descended by parachute the after-section of the fuselage (containing the propulsion unit) following him down in similar fashion.

Powered by a Walter 109-509 A-1 rocket motor, the Ba 349A version was capable of climbing at the phenomenal rate of 35,800ft/min to reach its ceiling at nearly 50,000ft. The radius of action after a height of 37,000ft had been reached was estimated at 25 miles. The armament envisaged consisted of 33 R4M-type rockets carried in the nose; after firing, the Natter became unstable because of the displaced c.g., and, as the machine fell back to a safe altitude, the nose section was discarded and the pilot parachuted away. At least, that was the intended method, for although many tests were made under the control of an autopilot, the war ended before the weapon could be used operationally.

Another interim scheme was demonstrated by the air-to-air X-4 missile, which was "wire-controlled": command impulses were transmitted directly from the launching aircraft through fine wires which unwound from bobbins on the missile.

An original idea for the guidance of rocket missiles was conceived as long ago as 1925, when it was suggested that a rocket could be made to climb along a searchlight beam by means of a control system worked by four selenium cells. A cell would be fitted to the tip of each fin so that, if the missile deviated from the centre of the beam, each cell would react to a different intensity and a simple transmission device, acting on the rudders, would re-stabilize the missile. Thus, having once been picked up, the missile would remain captive in a pencil of light. This was obviously one scheme that looked well on paper but offered little in practice, and in the form described it was never developed. Nevertheless, it has a striking parallel with the present-day Beam-Rider system which employs exactly the same principle except that ultra short-wave antennæ are used instead of selenium cells and the rocket climbs along a radar beam.

Fig. 5. The Fairchild Lark, here seen rising with the assistance of two Aerojet booster rockets, is a subsonic missile developed to a U.S. Navy specification.

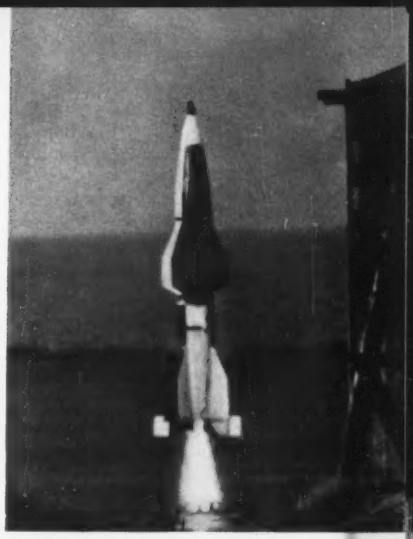


Fig. 4. One of Germany's most successful rockets, the Wasserfall was a supersonic missile designed to attack at altitudes between three and nine miles. It possessed astonishing stability.

A beam transmitter for guiding rocket missiles consists of a parabolic reflector with a rotating dipole. This is the accepted method of producing intensity variation in the beam with decreased value at its centre. The type of rocket normally envisaged for this system has cruciform wings and fins, and an antenna is located in the trailing edge of each of the four wings. These antennæ are linked in an oscillatory circuit in which the currents are amplified, rectified and, through relays, are made to actuate the control surfaces.

Such a missile will, of course, only travel on a direct course when all its antennæ are influenced to the same degree. Should it deviate from the centre of the beam, the antennæ will be influenced disproportionately, those farthest from the centre having more intense reception and causing the function of appropriate controls to re-centralize the rocket. This technique is shown diagrammatically in Fig. 2. It is usually considered in conjunction with a self-homing device which monitors the gyropilot so that in the final stage of an attack, the missile is self-directing.

The Beam-Rider system, however, has a great deal to condemn it in practice. To provide a usable intensity difference in the cross-section, the controlling beam must be reasonably narrow; to obtain the necessary variation, a wide beam would be impracticably strong in the fringe. Tracking is a delicate operation made especially acute when the target aircraft suddenly alters course and the missile is not yet sufficiently close to fly on its homing device. To have the beam too narrow will make it easy for the missile to escape from its controlling influence for, once the point of maximum intensity is passed, it will not re-centralize and will be difficult to pick up again. The sole remedy, therefore, is to effect a compromise by slightly widening the beam and relying on a smaller difference in intensity. This naturally involves correspondingly sensitive controls in the missile.

The better of the two directing systems is Command Guidance, which employs two tracking radars, one for the target aircraft and the other for the missile (Fig. 3). The technique was developed by the Germans during the war, when a two-man optical system (using telescopic sights and range-finders) was employed, commands being transmitted to the missile according to the impulses generated by moving a control stick. An adjacent transmitter, linked to the control box, relayed the initial impulses as radio signals on predetermined frequencies.

In the missile, these radio commands are translated, through a time-modulated system, into movements of the control surfaces by servo-motors. The greater the stick movement, the stronger is the modulation.

Control in the pitching and rolling planes depends on the relative durations of individual tones in pairs of audio-frequencies. When the stick is centralized, the tones in each pair are of equal duration and the servo-motors hold the controls neutral. If the stick is moved, the equi-period timing is disturbed and a sensitive polarized relay brings the servo-motors into operation to deflect the control surfaces.

To be fully effective, the interception of an out-of-sight target requires a command system which transcribes on a single cathode-ray tube the directional and distance plots from two radar sets, one representing the target bomber, the other the missile: the luminous "blips" are followed by the aimer, who manipulates the control stick to make them finally coincide. If the plots are fed into a computer, it is possible for steering orders to reach the missile automatically.

The Command Posts which direct guided missiles need not, of course, be restricted to the ground but may be carried in ships and

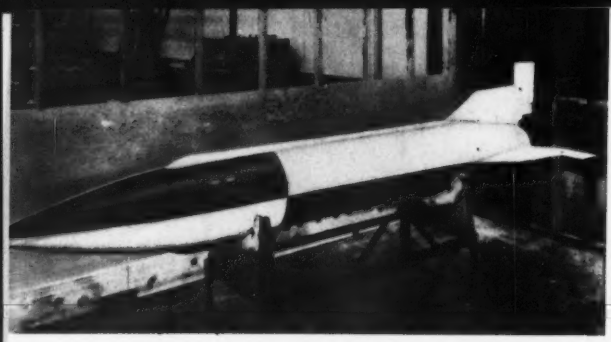


Fig. 6. The North American NATIV was designed for aerodynamic research and the development of control systems. It has reached an altitude of over ten miles.

Evolution of the Guided Missile . . . .

aircraft, and it is possible for control to be handed on from one post to another during the missile's flight.

The Wasserfall (Fig. 4), for which the Beam-Rider system of guidance was being developed in Germany, appears to have been remarkably successful in its early trials as an inherently stabilized missile. In many respects a small-scale version of the V.2 rocket, and powered by a B.M.W. bi-propellant motor with gyro-controlled exhaust vanes, it had cruciform wings of bi-convex section which, with very large fins and control surfaces, afforded perfect stability throughout its entire flight from subsonic to supersonic velocities. With a length of 25.6ft and weighing four tons at take-off, the missile was designed to attack at altitudes between three and nine miles and had a range of operation up to 30 miles. It is in many ways surprising that production of the Wasserfall was not taken up in Britain when the guided-missile programme was first laid down in 1945, if only to give our technicians "something to play with" in the shape of a successful missile. With such a primary vehicle, they could have carried out all their basic research on stability,-inherent control, booster techniques, remote guidance, etc., at an early stage, besides obtaining experience in the handling and servicing of a practical supersonic rocket—a rocket, moreover, that could not otherwise be had but for years of labour and vast expenditure. Failure to evaluate and exploit the German research effort in this practical sense has undoubtedly made the British missile programme both laborious and uneconomic.

The development of ground-to-air missiles in the United States has progressed steadily since work was begun at the California Institute of Technology in 1944. In 1945 emerged the W.A.C. Corporal, a rocket designed for high-altitude research but which was also regarded as the potential basis for an air defence missile. Other missiles under various stages of development as experimental A.A. weapons or troop-training vehicles, are the Boeing GAPA, the Fairchild Lark and the North American NATIV.

Fig. 7. An early missile in the Boeing GAPA programme being made ready in its launching tower in the heart of the Great Salt Desert, Utah.

The Lark (Fig. 5) was the outcome of research by the Guided Missiles Division of the Fairchild Engine and Airplane Corporation. It is now in quantity production for the United States Navy, being employed both as a launching-crew training-missile and as a flight test vehicle to prove a Fairchild developed target-homing system. From a cursory examination of the project, it appears that development problems have been reduced to a minimum by means of straightforward design. There is nothing about the missile that could be called spectacular, but from the large number of successful flights (over 100 test vehicles have been fired) one can assume it achieves a high standard of reliability.

With a length of 14ft 5in, the hull is cylindrical, with a subsonic streamlined nosing and a straight-tapered tail section. Two horizontal and two vertical wings are fitted mid-way along the hull, with four tail-vanes located quadrantally to the wings at the rear end. All the aerodynamic surfaces are rectangular and each carries trailing-edge control surfaces. On the wings, the control surfaces provide directional steering; on the tail-vanes, they control the flight attitude and serve as trimmers. Extensible ailerons, normally retracted within the vertical wings, snap out on either side to check any tendency of the missile to roll. A launching booster, comprising two standard Aerojet JATO units inside a large box fin, is attached at the tail.

Various materials are used in the construction. The hull is made up of five sections of light alloy, using normal aircraft monocoque practice, and two tank sections of stainless steel. The nose dome, which incorporates a semi-active target-seeking device, is of Fiberglas, a thermo-setting plastic. The wings are single aluminium extrusions, whilst the tail-vanes are moulded from Fiberglas sandwich material in which the receiving antennæ are inherently bonded.

The propulsion unit, manufactured by Reaction Motors Inc., is a bi-fuel two-motor system using red fuming nitric acid and aniline. After the booster jettisons, only the main "sustaining" motor operates, the "auxiliary" motor being called upon to supply additional thrust solely when executing manœuvres. The fuel and oxidant are pressure-fed to the motors by the compressed-air inflation of plastic bags within the tanks.

Perhaps the neatest feature is the method of installing electronic equipment. Each unit assembly of the guidance and telemetering systems is bench-wired and is placed in a quartered or halved container with a single external connector. Inside the missile, bulkheads are spaced to receive these containers, each bay having the corresponding connection point linking the equipment to its appropriate service. Thus, should pre-flight testing show up a fault in any particular circuit, the essential components can be disconnected and instantly replaced as a unit. Before assembly, all components are subjected to a 50g drop-test and a vibration test at 1,200 cycles per second.

The Lark has been produced under a Navy contract originating in 1945, and of the large numbers now becoming available, some will go to the U.S.A.F. for training purposes as well as to Naval test centres.

Of the other missiles, the NATIV (Fig. 6) is a test vehicle for aerodynamic research, control-system development, and the training of launching crews. Only 13ft long, with a diameter of 18in, it is fired from a tall metal tower and has reached altitudes above ten miles.

The GAPA (Ground-to-Air Pilotless Aircraft) project is really a development programme in which several prototype missiles are featured. Research at Boeing's was begun early in 1945 and the all-rocket powered vehicle originally produced (Fig. 7) has given way to a ram-jet missile with rocket booster. No details of this latter project are available except that the all-up weight is 5,000 lb with a 200-lb warhead, and the flight Mach number is 2.5. Considerable work is being undertaken in the United States by various agencies with ramjet propulsion units, among them Princeton University's Department of Aeronautical Engineering.

Fig. 8. The PTV-N-2 Gorgon 4, a pilotless aircraft built by Glenn Martin for the U.S.N. to test ram-jet propulsion units in free controlled flight.

HASTINGS C Mk.3
— new equipment for the
R.N.Z.A.F.
HANDLEY PAGE
RADLETT LONDON READING

A BASIC TRAINER

needs a good undercarriage!

The Percival P.56 Trainer is fitted with Messier undercarriage

BRITISH MESSIER LTD • GLOUCESTER

Evolution of the Guided Missile . . .

At Princeton, this work is part of Project Squid, a programme initiated in 1946 to advance the design of jet and rocket power units. Research is currently being directed into what is known as a "ducted rocket" which utilizes a liquid-fuel rocket as the primary stage, its hot exhaust gases being mixed with a secondary stream of air. It is thought that this type of propulsion unit may be particularly effective in an anti-aircraft missile.

What of Britain's progress in this important field? Are any ground-launched missiles in a comparable state of development in this country? Are prototypes of bi-fuel air-to-air guided missiles coming forward for service evaluation? What of the ramjet? On all these points, the Ministry of Supply prefers to remain silent on the familiar ground that comment "would not be in the public interest." And yet it is five years since serious work began—which seems a very long time for the public to be kept uninformed on so vital an aspect of the nation's defences.

One missile only can be mentioned, and although this was shown in a cut-away form for all and sundry to inspect at the 1949 S.B.A.C. show, for no obvious reason the Ministry still refuses to release an official photograph. The project clearly represents an early stage in the current British programme. With a length of 20ft, the device uses methyl alcohol and water as fuel in the proportion of 60 and 40 per cent, with liquid oxygen. The fuel and oxidant are displaced to the motor by the action of a slow-burning powder cartridge which is placed between two pistons in the cylindrical tanks. For cooling purposes, the fuel is first circulated through a jacket surrounding the combustion chamber.

A thrust of nearly 1,000 lb is exerted for 25 seconds, sufficient to maintain a flight Mach number of 1.4. A solid-fuel booster—actually a cluster of seven standard R.A.T.O. units—imparts a velocity of 1,700ft/sec after four seconds; then, as thrust falls off, air drag causes it to jettison. Four fixed fins and four movable control surfaces are provided on the main rocket.

At present used for aerodynamic, stability and control test purposes, this two-stage missile carries the usual telemetering equipment which enables data to be transmitted to the ground.

(To be continued)

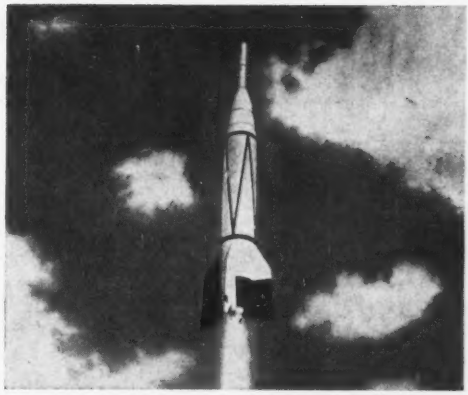


Fig. 9. Using a re-built V.2 as a primary vehicle, the WAC Corporal was discharged from the V.2 at a height of about 20 miles and then continued to a record height of 242 miles.

FROM 1 TO 27,000

LEADING personalities in Service, commercial and private flying attended the presentation at Londonderry House, on April 25th, of the 27,000th Aviator's Certificate to be issued by the Royal Aero Club. The recipient was Cdt. F/S. Alan Smith of No. 131 (Newcastle) Squadron, the 100th member of the A.T.C. to qualify for his Private Pilot's Licence under the Air Ministry Flying Scholarships Scheme.

Lord Brabazon of Tara made the presentation—most appropriately, in view of the fact that he himself had received the very first of the 27,000 certificates. That event, he said, took place "hundreds of years ago, when Big Ben was a watch." Modestly he told the gathering, that gaining one's licence today was a more difficult business: "You have to fly 30 hours, navigate like Captain Cook and know the law like a Lord Chancellor." Lord Brabazon concluded with a serious reminder that learning to fly had become very expensive; young people needed all the help and encouragement that could be offered.

As a direct result of the help and encouragement given him by the A.T.C., 18-year-old F/S Smith became Cadet Pilot Smith last Monday, when he reported to Cardington to begin his careeer in the R.A.F. He has been accepted for pilot-training, and will later be commissioned on an eight-year engagement. Smith joined the A.T.C. in February, 1948 and gained his "B" Certificate for gliding at Ouston. In November last year he reported to the Newcastle Aero Club at Woolsington. He soloed in a Tiger Moth after 6hr 55min of tuition and has now 20 hours' solo and 18 hours' dual flying to his credit.

The ceremony was probably the most impressive send-off to a Service career received by any prospective R.A.F. pilot. Among those who, by their presence, helped to make it so were Air Chief Marshal Sir William Dickson, Air Marshals Sir Robert Foster and J. N. Boothman and Air Vice-Marshals G. S. Hodson, A. C. Sanderson and T. N. McEvoy.

"Flight" photograph

At Londonderry House last week, Lord Brabazon presented Cadet F/S. A. Smith with the 27,000th Aviator's Certificate issued by the Royal Aero Club. Lord Brabazon is famed as holder of Certificate No. 1.

FESTIVAL BEACON

A RECENT M.C.A. *Notam* mentioned an unusual type of beacon that pilots approaching London might soon expect to see, namely, the 3,000,000 candle-power light at the summit of that famous London landmark the Shot Tower, which has been incorporated in the South Bank Exhibition.

The beacon, now operating nightly, was tested on April 24th. *Flight* was privileged to be present at the tests, not by reason of any concern with lighthouses as such, but because the installation is the work of a firm well-known in the aircraft industry—Chance Brothers, Ltd., of Smethwick, Birmingham. (The Chance "Square Beam" beacon is familiar to most people who have had anything to do with night flying.)

What particularly interested us about the Shot Tower light is its remote-control system. At the makers' London office in St. James's Square, about 1¼ miles distant, is a Marconi H.111 V.H.F. transmitter operating on 150-185 mc/s—the "Headquarters" type of local installation as used by B.E.A. A time-switch energizes the transmitter for a period of 30 sec, sending a coded signal *via* a four-element Yagi aerial mounted on the roof of the building and directed towards the Shot Tower. Received by a complementary aerial on the tower, the signal energizes a relay which switches on the lighting current and also starts the motor that rotates the optical element. A second signal transmitted at the appropriate time closes the beacon down.

The light is visible in clear weather at 45 to 50 miles. It rotates three times a minute, giving a double-flashing white beam every ten seconds. A stand-by lamp comes into action in the event of a lamp failure, and the driving motor is similarly duplicated. Remote-control systems of this kind are likely to be developed for unmanned marine lighthouses.

Incidentally, it was Chance Brothers who displayed the very first British lighthouse optic—at the Great Exhibition of 1851.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Once a Pilot . . .

I WAS very interested in the photograph on page 471 of your April 20th issue, showing the Sopwith Camel and the lighter from which Lt. S. D. Culley took off on August 11th, 1918, before shooting down the Zeppelin L53.

You may be interested to know that on April 27th, 1943, G/C. S. D. Culley had occasion to visit Woodley Airfield, Reading. His next appointment was at Aston Down in Gloucestershire, and I offered to give him a lift there in a Miles M.18.

He mentioned that he had not flown an aircraft for 25 years, so I offered to let him fly the M.18, which had dual control. He took off, flew to Aston Down and landed there without my having to touch the controls once.

I think you will agree that this was a truly remarkable achievement, and I only hope that he will repeat the performance in 1968. I shall be quite happy to accompany him.

Farnborough, Hants. D. L. BROWN.
Principal, the School of Gas Turbine Technology.

Airspeed History—A Postscript

THE recent correspondence concerning Airspeed Ferries and Couriers has interested me. What was the ultimate fate of G-ABSI and the Couriers owned by P.S.I.O.W.A. I don't know, but the following may be of interest to readers.

P.S.I.O.W.A.'s fleet consisted of seven Couriers, three Monospars, a Fox Moth, and the Ferry, G-ABSI. On the outbreak of war, the firm moved to Cardiff and operated under the organization known as National Air Communications, until all aircraft were taken over by the R.A.F. in March or April, 1940. About January, I took G-ABSI to Castle Bromwich with the intention of ferrying the Fairey test pilots from Castle Bromwich to Longbridge, where Battles were being produced. The Battles were only flown out of Longbridge and never landed there, hence the ferrying required. However, no trips were done as the top engine became unserviceable and we removed the airscrew and flew it back to Cardiff on two.

Whether G-ABSI ever flew again I don't know. The last I saw of the Couriers was at White Waltham, a year or two later. The A.T.A. used them for a while, but I do not know what happened to them.

Tarrant Rushton, Dorset. P. R. HORNIDGE.

[Though we have declared this correspondence closed, the above letter from the chief pilot of Flight Refuelling, Ltd., adds something new and merits inclusion—ED.]

A Boomerang Returns

ON page 431 of *Flight* for April 13th, in the article dealing with the Woomera rocket range, I notice the word "woomera" explained as the aboriginal term for a "boomerang-launching device."

In fact, the woomera is a spear-launching device designed to increase the power exerted by the aboriginal hunter by enabling him to impart propulsive effort to the spear for a greater time than if the woomera were not used. In essentials, it comprises a stick with a projecting spike at one end which fits into an indentation at the blunt end of the spear in the same manner in which a small boy uses his finger when playing with backyard spears.

Apart from such considerations as the reputation of *Flight* for technical accuracy regarding such things as airborne missiles and the means of launching them, the world-wide circulation of your journal may well include Australian aboriginal readers, who might develop complexes of some sort on learning that the device they have been using with success for perhaps thousands of years in launching spears should really have been used in launching boomerangs, an entirely dissimilar weapon both in shape and in function!

London, S.W.1. S. C. WEETMAN,
Aircraft Production Representative,
Australian Department of Supply.

The First British Seaplane Flight

THE article by H. F. King, "British Naval Flying" (April 20th), contains a reference to the first ascent made by a British seaplane. Aviation history attributes this to a Cdr. Schwann, but I would challenge this and say that it was made by Col. Stanley-Adams some two weeks later than the date mentioned for Cdr. Schwann's flight.

Whilst it is perfectly true that a flight was attempted on this day it should be recorded as unsuccessful, since it ended with the aircraft being overturned by a strong gust of wind and suffering damage. As a matter of interest, Col. Stanley-Adams was instrumental in their making the attempt in the first place. The Green engine in Cdr. Schwann's aircraft had given considerable trouble and was made to function only after the colonel had re-assembled the rocker gear correctly; it had been put together in such a way that it literally fell apart in his hands.

The first successful sustained flight by a British seaplane, therefore, was made in November, 1911, from Lake Windermere by Col. Stanley-Adams in a modified Avro aircraft built by himself and Mr. Wakefield, and I feel that the credit should go to these two pioneers of far-off days.

I am happy to say that Col. Stanley-Adams is still with us and, whilst no longer connected with the world of aviation, is still very active in his work at Scotland Yard, where he has remained for the past thirty years.

London, S.W.13. D. R. STANLEY-ADAMS, R.N. (ret.)

Fiskerton's Fido

I WAS very pleased to see the reference to Fiskerton's Fido in your editorial of April 13th, but I think that the whole of the story is worth the telling, i.e., that the first evening that Fido was in operation, Lincoln was under the impression that Fiskerton had been "plastered," and immediately despatched an N.F.S. (or was it A.F.S. at that date?) tender to the airfield. The firemen's comments when they got to the boundary fence and saw their "fire" were quite an education.

For the most part there was little emergency use of Fido during 49 Squadron's stay at Fiskerton. One very foggy afternoon a U.S.A.A.F. Dakota that had gone astray was brought in; the pilot claimed that the fog was so bad that at 500 ft. there was simply a red glow and he could not discern the direction of the runway.

Fido was, however, a very good landing guide on sunny days with a ground haze, when the wind direction necessitated landing into the sun. The practice then was to burn about a hundred-yard strip on the right hand side at the beginning of the runway and this was very clearly visible from the air.

There were some interesting consequences of Fido, such as (1) the flocks of rooks flying round at midnight when it was operating; (2) the flocks of aircraft it attracted to see the immense clouds of black smoke that always arose during the trial runs to clear the burners in the daylight; and (3) the flocks of articulated petrol-tankers that used to queue up on the Lincoln road to refill the installation when it was on for any long period.

Tolworth, Surrey. T. N. SIMPSON,
(Ex-Sgt. Fitter 2A)

The Mother of Invention

I AM just an ordinary student interested in aeronautical design. Whilst reading the book called *Modern Aircraft Design* I noticed that the author, Mr. J. L. Nayler, said that the undercarriage of an aircraft is essential, but aircraft have landed successfully without the use of an undercarriage.

I think that the aircraft which landed safely without an undercarriage, that is, on its fuselage, is not going to repeat this operation several times as it would do with an undercarriage. The fuselage will not withstand this strain. On the other hand, I agree with Mr. Nayler that the undercarriage takes up much useful space and is heavy. I think an aircraft should have an undercarriage, but a much lighter one.

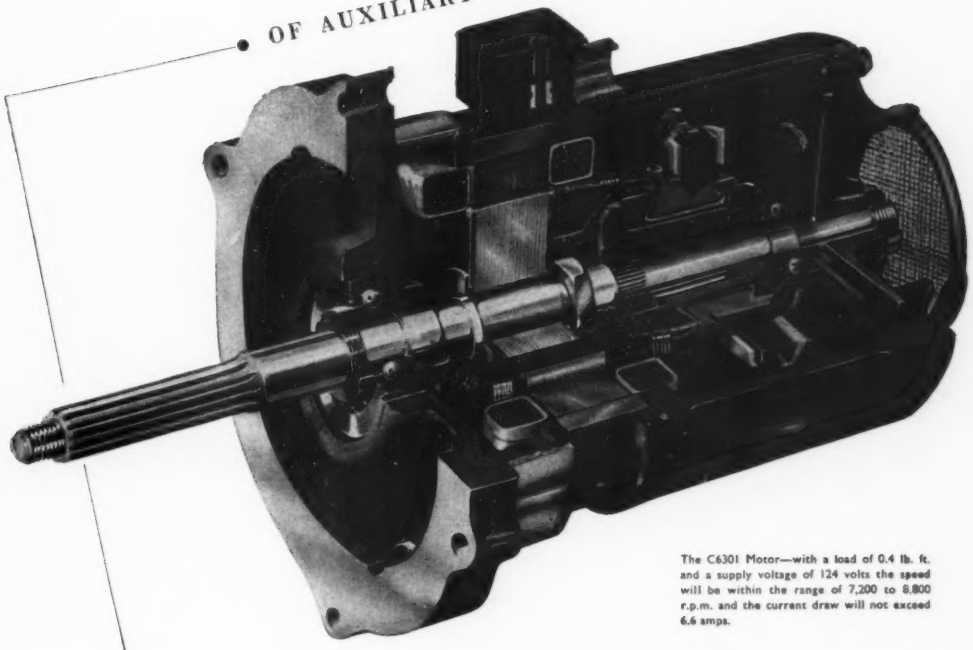
May I now make my suggestion? I suggest that on the take-off the aircraft should be catapulted into the air, similarly to the operation done with the Royal Navy aircraft when leaving cruisers. The main difficulty lies in how the aircraft is going to land. I propose that the present undercarriage should be completely removed. The aircraft should land on two sledges, of which the front edge should be turned up, and only at this point should the sledge be connected to the fuselage. The sledges should be made of steel, (or any other metal provided it can withstand the stress and is a light metal). In place of the shock-absorbers I suggest having two separate balloons which are attached to the fuselage on each side. Their shape is similar to the two tubes used on the undercarriage of a Westland S-55 helicopter. The sledge should be fastened to the bottom of the balloon. The balloons should be made of strong canvas (or any other strong material), for they will be pumped up with air to a pressure which should withstand the whole weight of the aircraft. The balloons could be blown down when not needed and they can at the same time be used as shock-absorbers.

The above suggestion may not be successful in its performance, but we should always try, for necessity is the mother of invention.

Valetta, Malta. E. BORG.

THE ELECTRICAL ASPECT

OF AUXILIARY POWER IN AIRCRAFT



The C6301 Motor—with a load of 0.4 lb. ft. and a supply voltage of 124 volts the speed will be within the range of 7,200 to 8,800 r.p.m. and the current draw will not exceed 6.6 amps.

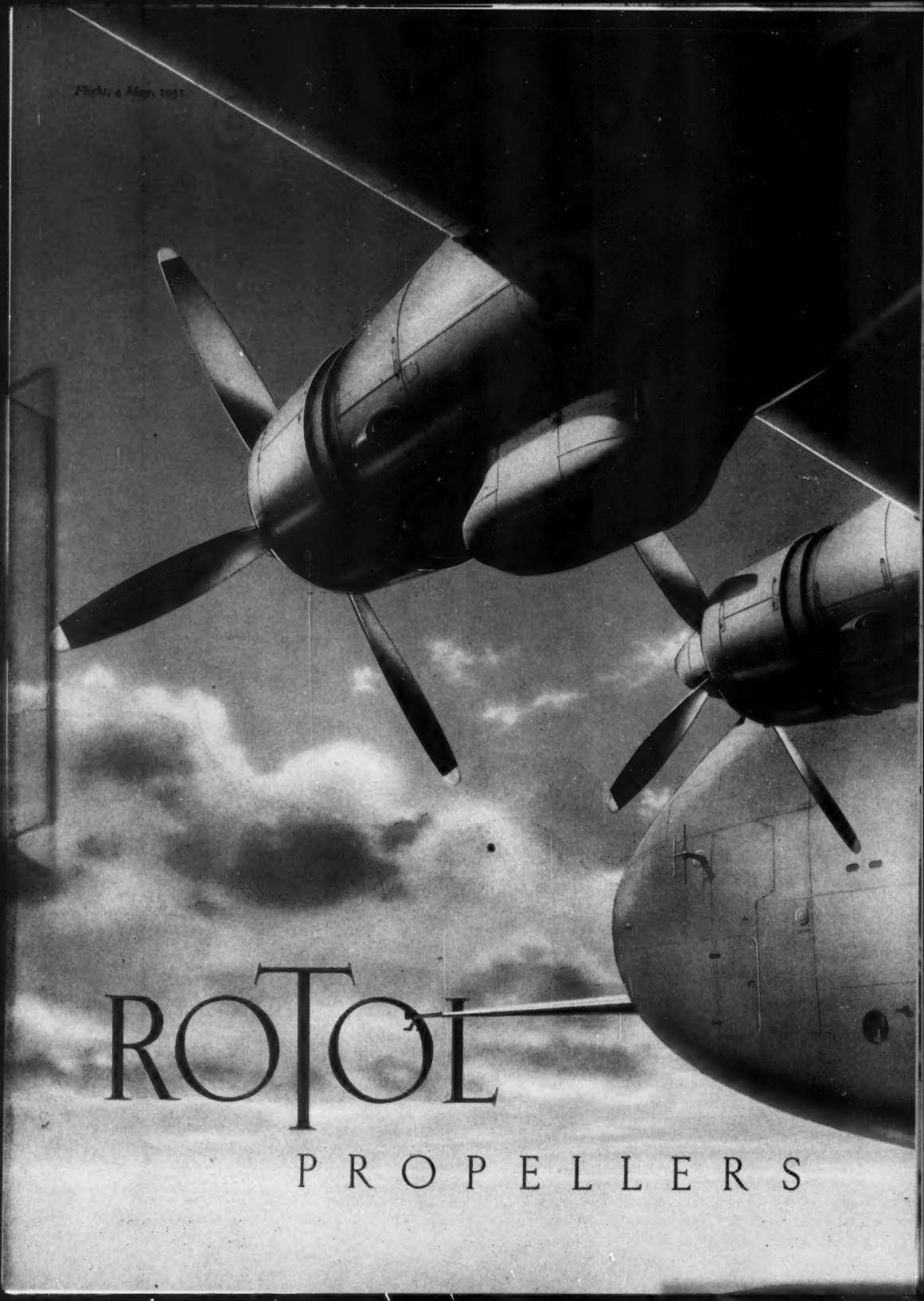
Our liaison engineers will be pleased to discuss with you the merits of the 110 volts D.C. (rectified A.C.) system with which the motor illustrated has been designed to work. This system reduces the cable weight considerably and allows a greater pay load. High supply voltages, either D.C. or A.C., are being used in most of today's leading aircraft, including the Bristol Brabazon, the Handley Page Hermes 4 and the Vickers Viscount. Rotax are proud to have supplied electrical equipment for all these aircraft, and the De Havilland Comet.

If you have any other problems, please let us send you one of our enquiry forms. It will make it very easy for you to state your exact requirements.

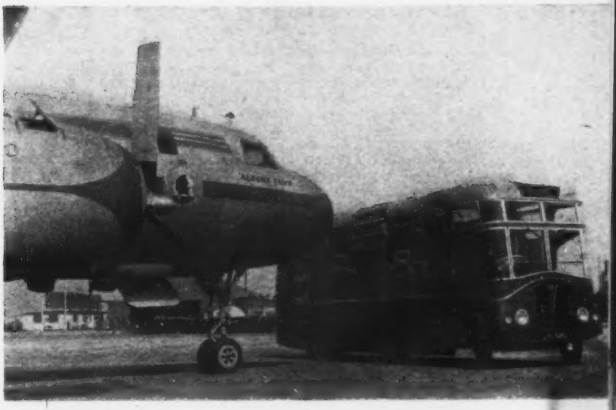
Complete Electrical Systems for Aircraft

ROTAX

ROTAX LIMITED, WILLESDEN JUNCTION, LONDON, N.W.10, ENGLAND
ROTAX AUSTRALIA PTY., LTD., 81 BOUVERIE STREET, MELBOURNE, N.3
ROTAX CANADA LIMITED, MONTREAL AIRPORT, DORVAL, P.Q.


ROTOL
PROPELLERS

CIVIL AVIATION



LUXURY GROUND-LINK: The new air-conditioned Foden "two-tier" coach now carrying passengers between the K.L.M. Sloane Street terminal and London Airport. It has the capacity of a Convair-Liner (the nose of one is seen in the picture) less the usual 10 per cent of passengers who travel to the airport independently. The coach is operated for Royal Dutch Airlines by United Service Transport, Ltd.

APOLLO WITH MAMBA ASM. 3s

THE first Armstrong Whitworth Apollo, G-AIYN, has now completed 226 hours flying, and work on the second machine is going ahead, though at a somewhat slackened pace due to the maker's preoccupation with the defence programme. As already reported, the first Apollo flew to Orly last month and plans still stand for a tour of European capitals, including, in all probability, Brussels, Zurich, Geneva, Rome and Madrid.

It is possible that the second Apollo will be powered with the new Mamba ASM. 3 turboprops, as described in *Flight* of March 30th. Estimated figures for the aircraft so powered are: fuel consumption at maximum continuous power at 25,000ft, 235 gall/hr (speed 310 m.p.h.); fuel consumption at economical cruising speed (276 m.p.h.), 203 gall/hr; still-air range, 1,350 miles; ceiling, 30,000ft; rate of climb at sea-level on three engines, 1,350ft/min.

The maximum take-off weight is quoted as 45,000 lb and the maximum landing weight as 43,000 lb. Seating capacity is 26-31 and baggage space 330 cu ft.

DC-6B CERTIFIED

LAST week the C.A.A. issued its type certification for the Douglas DC-6B at weights of 100,000 lb for take-off and 85,000 lb for landing. Immediately upon issue of the certificate, Douglas made preparations to deliver at least four of the aircraft on their order book, two to United Air Lines and two to Western Air Lines.

The company states that it has orders, from 12 operators, for 91 DC-6Bs which will ultimately be approved at weights ranging up to 106,000 lb.

Five, to the value of over $5 million, have been ordered by Western Air Lines for delivery beginning in September next year. Some five feet longer than the standard DC-6, the 64-passenger 6B as ordered by Western will cruise at 310 m.p.h. on the power of its four P. and W. R-2800-CB16 engines.

As we reported last week, certification of the DC-6B was temporarily delayed by a controversy between the C.A.A. and the constructors as to whether spoilers should be fitted. Douglas had feared that landing characteristics would be impaired.

INTERNATIONAL AIR BROKERS' ASSOCIATION

AN International Association of Aircraft Brokers is to be formed as an outcome of a meeting held in Paris on April 19th-20th and attended by 25 brokers from eight European countries. The broad policy is to be as follows:

(1) The establishment of good market conditions and the placing of international air business on solid and firm foundations.
(2) To provide facilities for its members to increase business.
(3) To organize a better information service between its members.
(4) To organize the co-operative study of documents of carriage, with the object of improving on existing ones or drafting new ones, and to draft a suitable form of contract for the sale and purchase of aircraft and parts.

It was decided that aircraft brokers will be recognized by the Association, and may be approved for membership, if they are actively engaged in the business of chartering aircraft, the promotion of air business generally, or the sale and purchase of aircraft or parts.

An organizing committee of ten was set up, representing the United Kingdom, France, Holland, Norway, Sweden, Denmark, Italy and Germany. The British representative is Mr. J. Beesor of E. A. Gibson and Co., Ltd.

ETHIOPIAN PROGRESS

FROM Ethiopian Air Lines, Inc., comes a statement showing that revenue passengers carried during 1950 numbered 22,731, as compared with 16,925 in 1949. Aircraft miles flown rose from 1,265,830 in 1949 to 1,305,725, and revenue ton-miles from 957,290 to 1,305,725.

Towards the end of last year the company purchased two Convair 240s, which were put into service on our international routes on January 15th.

Ethiopian now operates its Convairs twice weekly from Addis Ababa to Cairo and from Addis Ababa to Nairobi; and once fortnightly from Addis Ababa to Karachi *via* Jeddah and Dhahran. In addition, Asmara, Port Sudan, Djibouti and Aden are served, while internal routes reach 16 townships within Ethiopia.

RETORT COURTEOUS

AS a change, it would seem, from play-writing, Mr. Noel Coward has taken to "long-short" stories, and the March-April issue of the magazine *Lilliput* prints one such story from a collection published for Mr. Coward by Heinemann.

Its setting is a B.O.A.C. Constellation flight, and its treatment appears to have caused something of a flutter in the Corporation dovecote—so much so that the chairman, Sir Miles Thomas, has been moved to pen some restrained but forceful comments for a forthcoming issue of *B.O.A.C. Review and News Letter*. We are permitted to publish it here—and, incidentally, we think that readers will agree that his present responsibilities have not impaired Sir Miles's very considerable journalistic talents. Under the heading "Mr. Coward's Flight of Fancy" he writes as follows:

"A considerable amount of comment—some wry, some jocular—has been aroused by a short story, *This Time Tomorrow*, by Mr. Noel Coward in a recent issue of *Lilliput*. It purports to portray the emotional reactions of a first-time air traveller, a lone lady who flies on the B.O.A.C. Constellation service from London to Jamaica.

"Some of our more sensitive staff members have angrily claimed it to be unfair and distorted; they say it is bad for aviation in general and B.O.A.C. in particular; that it paints a forbidding and unwelcome picture of modern air travel.

"Personally—and I am not alone—I do not share that view. Mr. Coward lives in Jamaica for much of the year; the background to his story is keenly observed and we must respect his judgment of nervous emotions in the type of people about whom he writes. Admittedly, the typical Coward character is not everyone's ideal. From Elyot and Amanda, the excitable divorcees in *Private Lives*, through the colourful if not always savoury galaxy of highly strung people that he presented to the disenchanted pre-war public, there ran consistently a very peculiar streak. Always was there something self-consciously precious.

"So it is with the central figure of this quite absorbing little story of air travel by B.O.A.C.

"The point I want to make is that we must not be angry that

CIVIL AVIATION . . .

our efforts to run a swift, comfortable and regular schedule halfway round the world to the romantic West Indies attracts an occasional cynical barb. Read the story through to the end and you will find that essentially—except in one important matter—Mr. Coward has been quite fair in his penetration.

"The exception is his unnecessarily cruel picture of our stewardesses and stewards. An overwrought imagination might possibly see them as does Mr. Coward's heroine. But it is very unlikely. Our stewardesses do not 'mince'—they walk gracefully; they do not say 'Can I tempt yeow to a little chewing gum?' If they did, they would not be our stewardesses.

"But this caricature of comic character—a common device—is charitably allowable as poet's licence.

"Therefore let us welcome and benefit from this sharply drawn picture of one of the passengers we seek and serve. Let us learn graciously from this objective view of the mental approach to flying by a slightly neurotic first-timer. Thus shall we be more deeply understanding of their doubts and delights—and so turn Mr. Coward's romance into the happy realities of extended services."

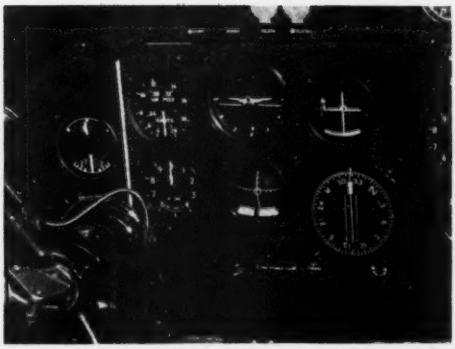
WHAT THE PASSENGER THINKS

A DISCUSSION entitled *Air Travel from the Passenger's Point of View*—the closing event of the Royal Aeronautical Society's Spring Lecture Session—was held in London last Thursday, April 26. It marked a pleasantly informal change from the usual lectures, and a number of ladies was present. Amusement at some of the speakers' remarks—particularly those of Mr. Peter Masefield—was followed by sadness at the closing words of the president, Maj. Bulman, who expressed the Society's regret that the retiring secretary, Capt. J. Laurence Pritchard, was that evening leaving the rostrum for the last time.

After the president had introduced the first two speakers, the discussion was opened by a King's Messenger and seasoned air traveller, Mr. Huntingdon. He mentioned the varying standards of airport passenger-handling, and the passenger welfare aspects of several aircraft. The feminine viewpoint was delightfully stated by Lady Douglas, the wife of B.E.A.'s chairman. Among further items mentioned were backward-facing seats; the relative claims of cheapness, safety and comfort in transport aircraft; the importance of the passenger's "mental comfort," and the appeal of the flying-boat. We hope to include a more complete summary of the discussion in a forthcoming issue.

SPERRY DEMONSTRATOR

AN Anson XIX was recently purchased by the Sperry Gyroscope Co., Ltd., for test and demonstration of the company's aeronautical products. Before being put into operation the aircraft underwent extensive overhaul and refitting, which included the installation of a completely new instrument panel. This provided dual flight panels with instruments re-positioned to comply with the new layout as agreed by the Corporations. On the panel (illustrated here) are fitted the air-speed indicator and altimeter on the left, the Sperry electric gyro-horizon at the top centre, with Zero Reader indicator underneath, and the I.L.S. cross-pointer meter at top right; in the bottom right-hand corner is fitted the gyro unit of the Sperry Gyrosyn compass, type C.L.2.



The new Sperry panel fitted in the company's Avro XIX demonstrator; the instrument arrangement is described in the news item on this page.

The Zero Reader shown in the photograph is one of three prototypes which were made up with a ball bank-indicator incorporated; in production models this type of indicator will not be used, a reversion being made to the simple cross-pointer presentation.

To enable passengers to follow flight procedures and to obtain additional data on instrument operation, a second instrument panel has been fitted in the cabin.

In March, the Sperry Anson paid its first visit to the Continent in its new colours. Demonstration flights were given to members of the French Services, several airlines, aircraft manufacturers and others, all of whom, it is reported, expressed themselves most impressed by the new arrangement. After visiting Paris, a short visit was paid to Brussels.

THE AER LINGUS YEAR

THE Aer Lingus report for the year ended March 31st, published last week, shows that 221,542 revenue passengers were carried, an increase of rather over 9 per cent. on the previous year's figure. Passenger mileage was 50,271,000, and the passenger load-factor 69 per cent. Freight ton-mileage was 449,000 and mail ton-mileage 29,000.

With the exceptions of the Dublin-Manchester and Dublin-Liverpool routes, where there was a slight recession, all services showed a considerable increase in business. The largest was recorded on the Isle of Man route, which showed a 64 per cent rise. Next came the Dublin-Paris service, on which 6,744 passengers travelled, 55 per cent more than in the previous year. The Amsterdam route, which was used by 7,529 passengers, showed an increase of almost 25 per cent.

BREVITIES

ON May 1st B.O.A.C.'s London and New York Stratocruiser services were increased in frequency from nine to 14 flights a week in each direction. Calls are being made at Boston on Thursdays and Saturdays (eastbound) and on Wednesdays and Saturdays (westbound).

* * *

Commercial air traffic movements at Orly and Le Bourget in March amounted to 1,328 and 2,770 respectively.

* * *

The C.A.A. is at present holding an enquiry into allegations that Colonial Airlines, Inc., who operate between New York and Montreal, have violated one or more provisions of the Civil Aeronautics Act, including that against free or reduced-rate transport.

* * *

S.A.S. announce the inauguration of the longest route on their network—from Stockholm to Tokyo, 10,300 miles. A weekly service with DC-6s began on April 25th, *via* Copenhagen, Frankfurt, Zurich, Rome, Lydda, Karachi, Calcutta, Bangkok and Hong Kong.

* * *

B.O.A.C. have appointed Mr. Andy Johnson as their sales manager in the Miami (Florida) area. After serving in R.A.F. Transport Command in Montreal during the war, Mr. Johnson became one of the Corporation's first "travelling salesmen." B.O.A.C. Miami sales district will continue to be under the jurisdiction of Mr. Harry Good, sales manager (East), North America, while Mr. John Alexander will continue as station manager at Miami.

* * *

Air India International has increased the frequency of its service between the United Kingdom and India to four flights a week in each direction. All services are operated by Constellation L-749As.

* * *

The Australian Department of Civil Aviation hopes to make an 80 per cent improvement in the bad-weather availability of Essendon airport, Melbourne, by the installation of a horizon-bar approach system. It is expected to be in operation by mid-July.

* * *

Mr. Frank Lloyd, de Havilland commercial manager, is at present on a six or seven weeks' tour of Australia and New Zealand, where he is visiting Service authorities and—to discuss Comet and Heron possibilities—the civil operators. From Wellington, N.Z., comes a report that Tasman Empire Airways are interested in Comets as replacements for their Solents.

* * *

Zoological cargoes recently carried by Trans-Australian Airlines include two fully grown lions, a case of toads, two race-horses, four greyhounds, some thousands of canaries and two venomous snakes. A.N.A. have booked rarer *fauna*—a male and a female platypus to be carried from Victoria to a breeder in Western

TITANINE

TITANINE FINISHES

AIRCRAFT FINISHES

used on the Boulton·Paul Balliol T.2

In production for the Royal Air Force as its standard advanced trainer covering the full range of requirements for instruction in flying, navigation, gunnery, bombing, photography etc.

Apply for demonstration and particulars from

TITANINE LIMITED

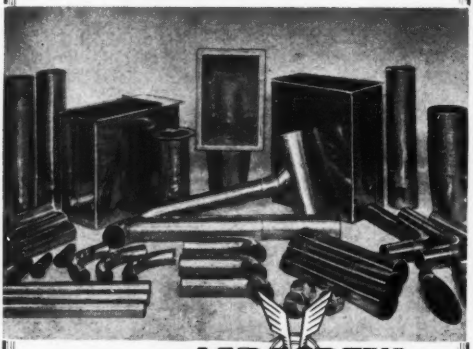
COLINDALE - LONDON - N.W.9

Telephone: Colindale 8123 (6 lines).

Factories
LONDON · SURREY · SCOTLAND

Associated Companies
U.S.A. and HOLLAND

"Service to Aviation"



AIRSCREW

SHEET METAL WORKING

THE services of the Airscrew sheet-metal working shops are at the service of the industry.

Airscrew's aircraft background and experience of working to fine limits can be invaluable to any organisation which cannot cope with this most important part of production. From engine cowlings to ducting, you can rely on Airscrew.

The AIRSCREW COMPANY & JICWOOD, Ltd., has an unsurpassed record of service to aviation. Among its products are:

WEYBRIDGE BLADES
AIRSCREW PROPELLERS
ENGINE TEST FANS
WIND TUNNEL BLADES AND FANS
WIND TUNNELS
SMOKE TUNNELS
RECIRCULATING FANS FOR PRESSURISED CABINS
AXIAL FLOW & CENTRIFUGAL FANS
SHEET METAL WORK FOR THE AIRCRAFT INDUSTRY

Among other products are the Jicwood Insulated Container (for the safe transit of perishable goods through varying conditions), Jicwood Insulated and Stressed-Skin Materials for Aircraft, and Bus Roofs (for airport coaches and buses).

THE AIRSCREW COMPANY & JICWOOD LTD.

Weybridge • Surrey

'Phone: Weybridge 1600 'Grams: Airscrew, Weybridge

UNUSUAL PROBLEMS SOLVED WITH Bostik

CASE 3

OLD KING COAL must keep moving!

ONCE COAL IS CUT it must be conveyed. In fact, next to coal-cutting, coal conveying is the most important part in the vital work of wresting black diamonds from Mother Earth. The conditions under which conveyor-belts operate are very severe indeed. Cuts occur in belt after belt. A Bostik Adhesive impervious to water has been produced for the purpose of repairing these cuts. It wouldn't strike the average person that an industrial adhesive could play such an important part in coal mining. And perhaps it hadn't occurred to you, until now, that Bostik products of one grade or another might be the solution to an industrial adhesive problem of your own. Brief details to B. B. Chemical Co. Ltd., Ulverscroft Road, Leicester, could be the turning point.

There might well be a use for

Bostik

Industrial Adhesives and Sealing Compounds in YOUR Business

* FESTIVAL OF BRITAIN—See how Modern Life depends on R-U-B-B-E-R

CIVIL AVIATION . . .

Australia. European operators who may find themselves transporting these creatures may like to note that their favourite food is (or are) yabbies.

* * *

A new company record for passenger-miles flown in a single day by aircraft of T.W.A. was set up on April 1st, when a total of 6,308,908 revenue passenger-miles was recorded; only about a quarter of this was flown on international routes.

* * *

A serious fire in B.O.A.C.'s No. 3 hangar at London Airport early in the morning of April 27th destroyed much valuable equipment. A Constellation and a Stratocruiser were got out in time, and the Comet on loan to B.O.A.C. from the M.o.S. was removed from an adjoining hangar.

* * *

Several papers on aviation and airport fire precaution will be read at the fifty-fifth annual meeting of the National Fire Precaution Association at Detroit from May 7th to 11th. Among the British delegates will be Mr. W. G. Glendinning of the R.A.E., Farnborough, who will read a paper on "Suppression of Fuel-Air Explosions."

* * *

Airport, road and runway design is the subject of Road Research Technical Paper No. 20, *Pavement Design for Roads and Airfields*, published for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 1s 9d. Principal contemporary methods of design are critically surveyed and assessed in the light of data obtained from investigations by the Road Research Laboratory.

GEMINI ON ONE—with four up, as demonstrated by S/L. John Reid, who operates the Nelson-Takaka (New Zealand) service with a Cirrus Gemini. The aircraft, ZK-AUA (formerly G-AKDL) was supplied last year by W. S. Shackleton, Ltd., of London.

The Italian airline, L.A.I., which inaugurated a New York-Rome service last year, is to increase the frequency of this service to twice weekly sometime this month.

* * *

B.E.A. have prepared a folder showing the attractive selection of posters which they have made available for use in window displays. They report a gratifying response from some hundreds of leading stores invited to apply for the posters.

* * *

Mr. A. W. Savage, Singapore's Director of Civil Aviation, said in London last week that the Colonial Office had approved a £2,300,000 project for a new airport at Paya Lebar on Singapore Island. This move follows the abandonment of the £4 million development scheme for Changi as a civil and military airfield.

FROM THE CLUBS

WITH the object of strengthening international enthusiasm for private flying, the Association of British Aero Clubs and Centres has arranged for its member clubs, during the Festival of Britain period, to offer honorary membership to all members of flying clubs and similar organizations visiting this country from abroad.

A special concession by the M.C.A. will enable visitors with licences issued abroad to fly aircraft at British clubs without the validation normally required. This relaxation is detailed in M.C.A. *Information Circular* No. 60/51.

FLYING times for March, reports the Wiltshire Flying Club from Thruxton, amounted to 181½ hr, bringing the total since January 1st to 415½ hr. At least two club members are likely to be entering for the King's Cup Race—Mr. Geoffrey Marler (Falcon) and Dr. W. L. James, O.B.E., who has recently acquired Mr. Taylor's Chilton.

The club is hoping to take delivery of a Proctor, which will be available for charter and, at a special reduced rate of £5 10s an hour, for dual or solo by members.

THE monthly report of the Royal Singapore Flying Club shows that 164¾ hr were flown in February, 22 hr of this total being on charter work. Cross-country flying has again been popular. One member, Mr. Jack Trefusis, celebrated the acquisition of his cross-country permit by making a round trip to Penang and back in a flying time of 11 hr 50 min over a period of five days.

An interesting sidelight on local conditions is that the club's new engine-assembly shop, now almost completed, has been built as an airtight room with a blower and filter so that engines can be erected in a dust-free atmosphere.

THE Redhill Flying Club's first "dawn patrol" of the season proved to be one of the most popular meetings since the war; it even compared well with those of pre-1939 days.

The morning of April 22nd arrived with glorious sunshine and an easterly wind with a sufficient bite to clear heads at that early hour. Club members started to arrive by seven o'clock—participants, marshals, various young offspring complete with binoculars hoping to find a passenger seat, and a considerable number of people to put in some refresher hours on the catering side—including an R.A.F.O. officer on annual training who very successfully wielded the frying-pan for some two hours, by which time he had seen quite enough of bacon and eggs to last him till next year's training.

Three Magisters and four Austers of the Club were commissioned for the defence, together with the Moth Minor of the Ultra-Light Association, plus one Maggie, two Proctors, one Whitney-Straight and two Geminis belonging to private owners; there was also the prototype Miles Aries.

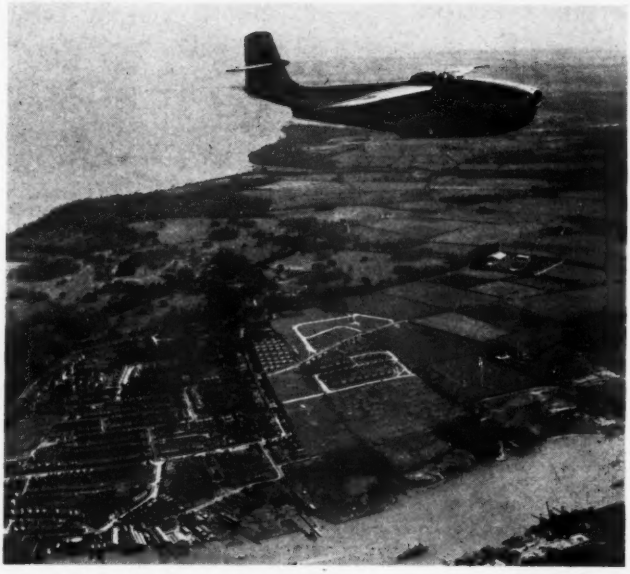
Dead on 0900 hr there arrived a Dragon from Denham, out of which stepped some six adults and one child (all for free breakfasts); there followed a steady stream until 0930—36 visitors in all. A considerable number had free bacon and eggs, as the Club apparently considered that in these hard times of rationing they needed sustenance.

Some fifty-odd aircraft lined up outside the club and made a most impressive array. The only excitement occurred when—as we recorded last week—the pilot of the Aries landed with the undercarriage up.

BREAKFAST TIME: The impressive line-up at the Redhill Club's "dawn patrol," described above. The variety of aircraft types represented is a noteworthy feature.

SERVICE AVIATION

Royal Air Force and Naval Aviation News



SPEEDBOAT: Pictured over the River Medina, Isle of Wight, is the only prototype Saunders-Roe SR/A.1 fighter flying-boat, now undergoing a new flight-testing programme. Two 4,000 lb-thrust Metrovick Beryl turbojets make the A.1 the world's fastest water-based aircraft, with a speed of over 500 m.p.h. Armament is four 20 mm guns and bombs or rockets.

THREE aircraft carriers—the *Indomitable, Vengeance* and *Indefatigable*—are taking part in the Home Fleet's three months' summer cruise, which began recently. Some of the ships were initially engaged on other duties, including flying training and anti-submarine training, and will join the Fleet later.

The Fleet is under the command of Admiral Sir Philip Vian, flying his flag in the fleet carrier *Indomitable;* the flag of Rear Admiral C. John, commanding the Third Aircraft Carrier Squadron, is being worn by the light fleet carrier *Vengeance.* During the cruise, ships will visit Invergordon for training, take part in manoeuvres with the Submarine Fleet in the Irish Sea and visit ports and resorts in the United Kingdom. Certain of these visits are being made in conjunction with the Festival of Britain and plans are being made for the reception of visitors in H.M. ships, and for floodlighting the vessels.

More Australian Awards

IN our previous issue a number of British awards were announced for pilots of No. 77 Squadron, R.A.A.F., operating in Korea. Seventeen American decorations were recently presented to squadron members in Tokyo by Lt.-Gen. E. E. Partridge, commander of the Fifth United States Air Force. The total number of decorations won by this outstanding unit since the Korean conflict began is now 69.

Vampires in Action

FOR the first time since their introduction to the R.A.F. in 1945, de Havilland Vampires have been used in action. The baptism of fire—on a small scale, but effective—took place in Malaya on April 26th, when two Vampires were called upon to attack an objective in Johore.

The jet fighters each attacked their target—a bungalow on an abandoned rubber estate—with eight 60-lb rocket projectiles and their 20-mm guns. The pilots—S./L. W. G. Duncan-Smith and F./L. W. James—reported complete destruction of the bungalow, which was used by bandits as a hideout and rest-house.

R.A.F.V.R. Club Luncheon

NEXT Thursday, May 10th, at the Criterion Restaurant, Piccadilly Circus, London, the R.A.F. Reserves Club will hold its third luncheon. The guest speaker will be Air Marshal Sir Basil Embry, A.O.C.-in-C., Fighter Command, who will speak on "Some of the Problems of Air Defence." A large attendance is expected and members are, therefore, asked to reserve their tickets (12s 6d) with the secretary as soon as possible.

ANGLO-DUTCH: At R.N.A.S. St. Merryn, Cornwall, Sea Furies and Fireflies of the Royal Netherlands Navy are taking part in combined training with the Royal Navy. Dutch maintenance crews are seen receiving open-air instruction from the station's Engineer Officer, Cdr. P. T. Croome.

"Theseus" Returns

AFTER six months of gallant work against the Korean Communists, H.M.S. *Theseus* is now on her way back from the Far East. During 86 flying days, aircraft from *Theseus* flew 4,446 sorties, firing over 500,000 rounds of ammunition and 6,617 rockets.

Naval Exhibition

A COMPREHENSIVE travelling exhibition, typifying the equipment and work of the Navy, left the Royal Naval Air Station at Culham, Berks, on April 23rd for a 2,500-mile tour of inland districts and coastal areas far from Naval bases. Exhibits include a 10-ft. model of the aircraft carrier *Implacable,* and various types of turbine power plants.

Daily Met. Flight

SINCE 1924, daily meteorological flights have been made by the R.A.F. to obtain weather data for the Central Forecasting Office at Dunstable. As from Tuesday last, the duty has been taken over by Home Command and the daily flight is now made from a reserve flying school by a staff pilot, instructor or reservist. The last regular R.A.F. flight, by a night-fighter Mosquito from West Malling, was made, on April 30th, by F/L. J. H. Corré, D.F.C.

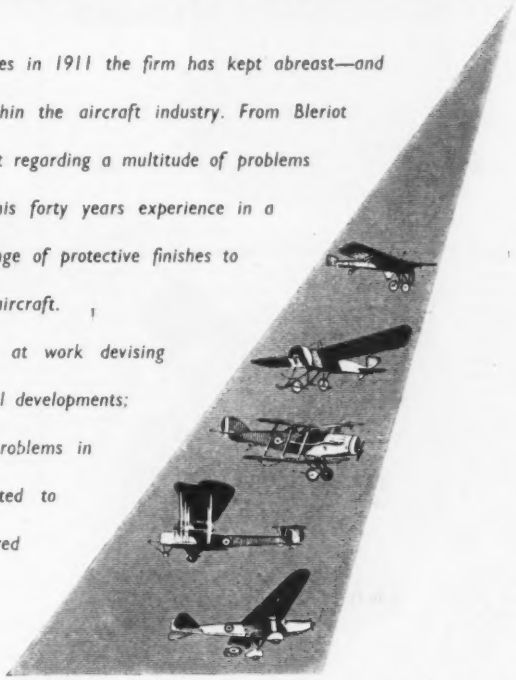
Shoreham Open Day

ORGANIZED by the Sussex A.T.C. Wing, one of the first displays of the season will be held at Shoreham on Saturday, May 12th. The programme beginning at 2.30 p.m., includes solo aerobatics by a Meteor 8 and Vampire 5, formation drill by Seafires, request aerobatics by Chipmunks, an appearance by the French Lafayette Squadron, and parachute descents.

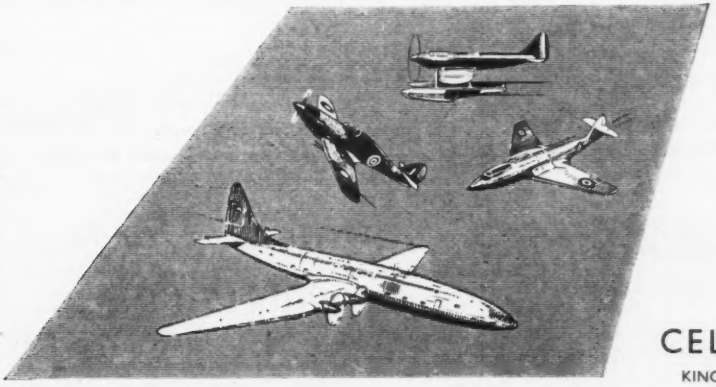
. . . from Bleriot to Brabazon

Ever since the inception of Cellon Aircraft Finishes in 1911 the firm has kept abreast—and frequently ahead—of technical developments within the aircraft industry. From Bleriot to Brabazon the advice of Cellon has been sought regarding a multitude of problems relating to aircraft finishing. The fulfilment of this forty years experience in a specialised field is represented by a complete range of protective finishes to ***approved*** *specifications for all civil and military aircraft.*

The Cellon research laboratories are constantly at work devising materials to meet the demands of new aeronautical developments; and firms, who encounter unfamiliar finishing problems in the course of their own experiments, are invited to make use of the knowledge that has been gathered and systematized by the Cellon technicians.



CELLON



AIRCRAFT FINISHES

Approved to A.I.D. and A.R.B. Specifications

CELLON LIMITED

KINGSTON-ON-THAMES · SURREY

Telephone: Kingston 1234 (7 lines) Telegrams: AJAWB 'Phone Kingston-on-Thames. *Also manufactured in Australia · Canada · France · Holland · Norway*

CVS-687b

ILLUSTRATING

an Isthmus in Istanbul

is easier with

WILLIAMSONS
AIR SURVEY
EQUIPMENT

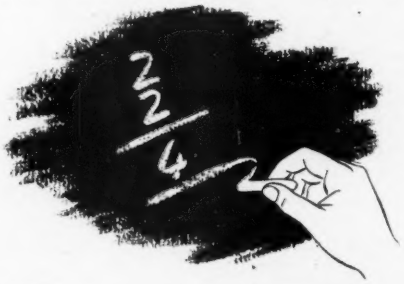
GENERALLY, these two do exactly as they please and if someone tries to stop them they go away and do it somewhere else. They keep this up for fifty or sixty years. In that time there is really no excuse for not helping themselves to straighten out their Survey problems with Williamsons Air Survey Equipment.

WILLIAMSON
Manufacturing Company Limited

Photographic Engineers
LONDON

In Canada : Williamson Company of Canada Ltd., Toronto, Canada

$\left(\frac{24}{13}\times\frac{39}{36}\right)+\left(\frac{36}{9}\times\frac{4}{8}\right)=\left(\frac{40}{4}\times\frac{2}{5}\right)$



Precision

Engineering reaches its greatest heights in the service of the aircraft industry. Both metal and its measurement must meet the new requirements of supersonic speeds. At Rubery Owen we have always been fully conscious that the standard of the small components controls the standard of flying performance. R.O. + A.G.S. = Precision.

Rubery Owen
Components

RUBERY, OWEN & CO. LTD., DARLASTON, SOUTH STAFFS
Manufacturers of Bolts, Nuts, precision A.G.S. parts for the British Aircraft Industry
Member of the Owen Organization
LONDON, BIRMINGHAM, GLASGOW, COVENTRY, MANCHESTER, SOUTHAMPTON, WREXHAM

No. 1 Temperature Measuring

The comprehensive range of Weston temperature measuring instruments covers the requirements of existing production aircraft, as well as types now under development. In addition to thermometry for the indication cylinder, air, oil and radiator temperatures, Weston equipment for aircraft includes instruments for power supply, navigational aid instruments, selector switches, etc.

WESTON
AIRCRAFT INSTRUMENTS

Illustrations show:

Above, Model S128. Dual Engine Temperature Indicator, comprising two Millivoltmeters of 100° scale housed in large-size S.A.E. case. For use in conjunction with copper/constantan, iron/constantan or chrome/alumel thermocouples.

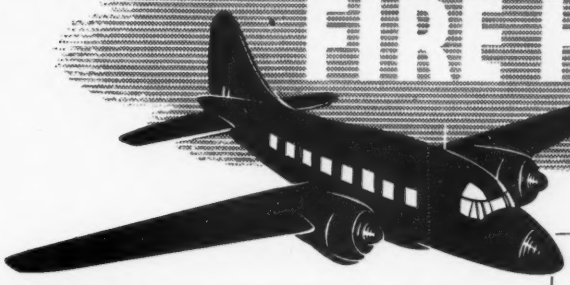
Below, Model S127. Dual Ratiometer Indicator, comprising two 100° Ratiometer movements housed in large-size S.A.E. case. For use in conjunction with thermometer bulbs, electrical oil pressure transmitters, electrical position indicators or any combination of two of these to indicate a variety of temperatures, pressures or position.

SANGAMO WESTON LIMITED
Enfield, Middlesex

Tel.: Enfield 3434 (6 lines) and 1242 (4 lines). **Telegrams: Sanwest, Enfield.**
Scottish Factory, Port Glasgow, Renfrewshire, Scotland.

Branches: Glasgow, Manchester, Newcastle-on-Tyne, Leeds, Liverpool, Wolverhampton, Nottingham, Bristol, Southampton, Brighton.

This switch fights FIRE HAZARD



Used extensively in leading British military aircraft with fully feathering propellers. The Venner Time Delay Switch is specially designed for use in aircraft fire extinguisher systems to delay discharge of the main methyl bromide spray until the engine has come to rest. Can also be adapted to disconnect the batteries within a specified period of time in the event of a crash. *As used on Vickers—'Varsity,' 'Valetta' & 'Valetta Class Room,' Handley-Page—'Hermes IV,' Avro—'Shackleton,' and other leading types of aircraft.*

FOR AUTOMATIC RADIO BEACON OPERATION SPECIFY THE VENNER CODER SWITCH

A fully automatic switch for the transmission of a predetermined call sign once in every 30 seconds.

We also specialise in Time Switches, Process Timers, Synchronous Motors, Programme Ringers, Stop Watches, Hour Recording Meters, Prepayment and House Service Meters, Delay Relays and Master Pendulum Clocks.

WRITE FOR LEAFLET T.S.23/F.

There is a VENNER *time switch for every purpose!*

VENNER Time Switches Ltd.

KINGSTON BY-PASS, NEW MALDEN, SURREY. *Telephone:* MALden 2442 (6 *lines*)

TRAVELLING LIGHT...

Reliable lightweight lighting equipment is a specified necessity in all commercial aircraft today.

Oldham aircraft batteries, with their power to spare, offer a source of electricity that, besides being thoroughly dependable under the most arduous conditions of use, show the greatest possible capacity-to-weight ratio.

That is why Oldham aircraft batteries are being increasingly used in British airliners, lighting both passengers and crew throughout millions of miles of travel annually.

OLDHAM

AIRCRAFT BATTERIES

with Power to Spare

OLDHAM & SON LTD · DENTON · MANCHESTER
EST. 1865

CHANGE OF ADDRESS

WYNN

Approved Stockists of all types of
AIRCRAFT INSTRUMENTS
also
AIRCRAFT ELECTRICAL ACCESSORIES

Immediate delivery in quantities
Released to A. I. D. or A. R. B. requirements

E. D. WYNN & CO.

★ *New Address* ★
STAVERTON AERODROME,
CHELTENHAM ROAD,
GLOUCESTER

Phone: Churchdown 3264 (3 lines) *Grams: 'Wynn Gloucester'*

Simply PUSH a "Pip" pin home and it is locked more securely than if split pinned or secured with a nut. Simply PULL and the automatic locking device is immediately released and the "Pip" pin follows your hand. What an improvement over all the other methods of pin locking!

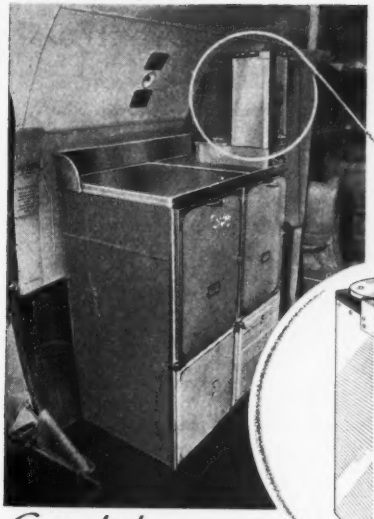
Available in an unlimited range of sizes and forms, for an unlimited range of applications. ASK FOR DETAILS.

USED IN THE PERCIVAL P.56

"PIP"
QUICK RELEASE PINS

AVIATION DEVELOPMENTS LTD.
KINGSBOURNE HOUSE, 229/231 HIGH HOLBORN, LONDON, W.C.1.
Tel: CHAncery 8601 (8 lines)

Photo by courtesy of "Flight"



A new Heated Food and Liquid CONTAINER

Designed jointly by the G.E.C. and *B E A*

This valuable addition to the famous range of G.E.C. electric heating equipment specially designed for aircraft is shown here installed in the B.E.A. "Pionair." Many uses will be found for the container in keeping cooked food or beverages hot for serving en route.

Constructed of highly-finished aluminium and monel, the weight has been kept down to 10 lbs. and the electrical loading is only 200 watts at 28 volts. Efficient lagging is achieved with "Idaglass" insulation material.

App. size 8 in. x 8 in. x 16 in.

Cat. No. **HO 3370.**

Consult the **G.E.C.** *on* **COMPLETE AIRCRAFT EQUIPMENT**

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

JJH

STEEL STRIP

SHEETS AND SECTIONS

TO A.I.D. SPECIFICATIONS

HABERSHON

ROTHERHAM

You'll be far better off . . . in a

WILLERBY HOME

£490 ex-works

22ft. x 7ft. 6in x 6ft. 9in.

Fully equipped and ready to live in, the Willerby Home fills a long-felt want on and about many aerodromes in Britain. Comfortable and attractively furnished; the double bed and two single beds each have spring interior mattresses, and panelled cabinets provide ample storage space. Calor gas lighting, heating and cooking. Your wife will confess that Willerby housekeeping is a delight.

With the 'Planet' Central Heating Unit fitted the price is £525—and heat, hot water and airing facilities are yours for *less than* 1d. *per hour*. 'Planet' Central Heating is also available for Homes and Offices. DOMESTIC INSTALLATIONS with fully automatic controls, from £85. Price includes fitting.

If you cannot call, write for our booklet illustrating the Willerby Range of Caravans. Models from £235 to £595. Sensible terms available.

MONTROSE

CARAVAN DISTRIBUTORS LTD.

STOCKPORT RD., CHEADLE, CHESHIRE - (*Gatley 6179*)

Also at HARWOOD BAR, GT. HARWOOD, Nr. BLACKBURN.

IF IT'S CARAVANS . . . IT'S MONTROSE

tenacity

FOR THE AIRCRAFT INDUSTRY

Surridge's "G.P." Cements remain permanently tenacious in the face of all hazards of vibration, water, anti-freeze mixture, etc. Their powerful bonding action does not deteriorate with age and their enduring elasticity prevents any cracking or loosening. They are particularly recommended for the effective, trouble-free adhesion of rubber to metal, wood, fabric and linoleum.

For prices and samples, or specialist help with any adhesive problem in the Aircraft Industry, write to us today.

● *For the waterproof sealing of cupola panels, windows and screens, use* **SURRIDGE'S GLAZING COMPOUND Number 12.** *Resistant to vibration and anti-freeze.*

SURRIDGE'S **G.P. CEMENTS**

BLACK, Number II
WHITE, Number IIA

SURRIDGE'S PATENTS LTD.
New Works,
Croydon Road,
Elmer's End,
Beckenham, Kent.
Tel., Beckenham 0168

R. E. PETHEN

A.M.H.C.I.

Caterer

BY APPOINTMENT TO THE LEADING AIRCRAFT CONSTRUCTORS AND OPERATORS

Personal refreshments, with free licence, arranged for all flying displays and functions. Caravans and marquees on site, supplied or stocked to individual requirements

ENQUIRIES INVITED

THE VICTORIA HOTEL

HAYES, MIDDLESEX

Telephone: HAYES 2789

THE COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING

(The Chelsea College)

Complete practical and technical training for entry to Civil and Commercial Aviation or the Automobile Industry.

Entry from School-leaving age.

Training for AIRCREW TECHNICAL EXAMINATIONS (Issues and Endorsements)

Syllabus from Bursar

Sydney Street, Chelsea, S.W.3

Telephone: FLAxman 0021

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY—*Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

FIELDS

ANNOUNCE the following for immediate sale :

AVRO XIX. Very low engine and airframe hours. Fitted A with full radio, including S.B.A.; 11 months' C. of A. This aircraft is fitted with metal wings and is completely modified to date. Without doubt one of the finest metal-winged Avro XIX at present in operation. £6,000 or near offer.

PROCTOR IV. Very low hours. Fitted with radio. Beautiful external and internal finish; 4 seats; C. of A. 6/60.

PROCTOR V. Only 500 hours since new. Current C. of A. Fully modified to date. A distinctive aircraft in perfect condition throughout. £695. Four-channel v.h.f. can be supplied with this aircraft.

MANY other aircraft of all types. We will be delighted to supply full particulars on request to :

FIELD AIRCRAFT SERVICES, Ltd., Croydon Airport, Surrey. Tel. Croydon 7777. Cable: Fieldair, Croydon. [0258

R. K. DUNDAS, Ltd.

WHEN it comes to buying or selling an aeroplane the astute always come to us for, oddly enough, it is widely acknowledged that we seem to pay more than usual when buying yet always manage to be cheaper than anyone else when selling. It doesn't make sense does it? The air business is crazy, anyway, and it's being years and years on the job that does it.

R. K. DUNDAS, Ltd., 29, Bury Street, London, S.W.1. WHI. 2846. Cables: Dundassaero, Piccy, London.

CROYDON Airport, CRO. 7744, Ext. 322 and 325. [0559

MESSRS. BROOKLANDS AVIATION, Ltd., have the following aircraft for sale:

D. H. 89A Rapide Mk. 1, 8-passenger, fitted 1154/1155 radio, upholstery by Rumbolds in red leather, external finish in red and silver. Low engine hours. C. of A. expiry date August 3rd, 1951. £1,300.

D. H. 89A Rapide Mk. 2, 6-passenger seats with separate radio compartment, fitted AD.87B AD.8882B radio; upholstery by Rumbolds in red leather, external finish silver with red flashes. Airframe hours 763. Low engine hours. C. of A. expiry date June 6th, 1951. £1,300.

PROCTOR M. III 3-seater, upholstery by Rumbolds in red leather, external finish in red and silver. C. of A. expiry date June 28th, 1951. £900.

PROCTOR M. I 3-seater, upholstery by Rumbolds in red leather, external finish silver with red flashes. C. of A. expiry date June 22nd, 1951. £300.

MILES Gemini. At present undergoing C. of A. renewal. Finished in blue. Airframe and engine hours 160 since new. £1,350.

ALL the above aircraft have been carefully maintained and serviced by our qualified staff, are fully modified and in excellent condition. A large selection of spare parts is also available for these aircraft.—All inquiries to the Manager, Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel. Moulton 2251/2. [0260

CENTRAL AERONAUTICAL BUREAU, Ltd., Croydon. Cables: Centralair, Croydon. Tel. Croydon 3382. The busiest Dakota brokers in U.K. offer:

DAKOTAS, C47As and spare parts always available. Engines, R1830-92, etc.

DAKOTAS, C47As. Prices from £16,500.

AEROVAN. This week's bargain. 12/12 C. of A., long-range tanks, b/flying, SCR 522, Nav. and landing lamp. £1,000. Deposit secures.

PROCTOR V. Extra low hours, v.h.f., dual, 12/12 C. of A., all mods., superb interior. £550.

EXTRA ! Consul. C. of A., 700 hours since new, six seats, 8ft 10/17. Delivered anywhere in U.K. for £750, or with two low-houred spare power plants for £900.

CENTRAL AERONAUTICAL BUREAU, Ltd., Croydon 3382.

FOR sale, Austers, Proctors, Rapides, Consuls, Tiger Moths, etc. Also all types of aircraft spares.—Vendair, Croydon Airport. Croydon 5777. [0603

FAIRCHILD Argus with C. of A., low engine hours. Re-upholstered and sound-proofed by Rumbold. Radio and b/l. panel. Nearest £550 secures.—Box 0607. [0159

PROCTOR I. Mk. 1, 3-seater, upholstery by Rumbolds red leather. Finished cream. 12 months C. of A. £300.—E.A.F.S., Southend Airport. [0264

AIRTRADE, Croydon Airport, have extensive stock of Tiger Moths and Tiger Moth spares. Very competitive prices.—Tel. Cro. 7744, Ext. 49. Cro. 0643. [0088

4-SEATER cabin Chrislea Super Ace aircraft for sale. Total flying time 60 hours. As new, full C. of A. Accept £1,250.—Owner, Woodlands, Malvern Road, Worcester. [0186

ANSON Mark I freighter. Early delivery with 12 months' C. of A. Fully modified with low hours both airframe and engine. Payload, 1,945 lb. Seven passenger seats can be fitted if required.—Box 0604. [0118

MARK VIII GOGGLES, brand new, fitted clear safety lenses and complete with spare pair of tinted lenses, 22/6. Mark VIII goggles, clear lenses only 19/6, post 6d. Spare lenses, tinted 3/9, or clear 5/- per pair. LUXOR GOGGLES, 50/-. R.A.F. Outer FLYING SUITS, new, 47/6. FLYING BOOTS, fully lined with white wool, 96/-. Brand new FLYING GAUNTLETS complete with electrically heated INNER GLOVES, 12 or 24 volt, 42/-. FLYING JACKETS, American and English in stock. Cosport Tubes, civilian pattern, 12/6; R.A.F. pattern, 14/6.

TERMS TO FLYING CLUBS. TRADE SUPPLIED. SEND 3d. IN STAMPS FOR ILLUSTRATED CATALOGUE.

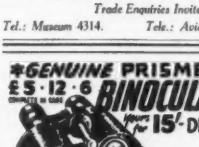
D. LEWIS LTD. (DEPT. F.)

Leather Clothing Manufacturers for Home or Export

124 GT. PORTLAND ST., LONDON, W.1

Trade Enquiries Invited.

Tel.: Museum 4314. Tele.: Aviakit, Wesdo, London



***GENUINE PRISMEX ***

£5·12·6 CARRIAGE IN CASE **BINOCULARS** ONLY **15/-** DEPOSIT

A quota of 600 only of these brand new famous powerful French made prismex Field and Marine Glasses makes this offer unrepeatable for the rest of this season. Bending Bar for eye adjustment; centre screw focus; deep penetrating crystal clear x30mm. achromatic lenses. Sent on 15s. deposit, balance payable 12s. 6d. monthly. Cash price £5 12s. 6d. carr. 1s. Complete W.D. case and sling. All famous makes in stock. Send for free list of 1,000 Prismatic Binocular Bargains. TENTS, FLYSHEETS, ETC. TERMS. FREE LIST.

HEADQUARTER & GENERAL SUPPLIES, LTD. (Dept. FLI/3),

190-200 Coldharbour Lane, Loughborough Junc., London, S.E.5.

Open all Sat. Closed 1 p.m. Wed.

COTTON BAGS

FOR SPARE PARTS, Etc.

WALTER H. FELTHAM & SON LTD.,

Imperial Works, Tower Bridge Road,

Telephone: HOP 1784 **London, S.E.1**

EAGLE AVIATION

Limited

offer a complete aeronautical service

6 AVRO YORK AIRCRAFT—World-wide charter

45 passengers—9 ton freight

AIRCRAFT OVERHAUL AND MAINTENANCE

SALES AND PURCHASE OF AIRCRAFT

HEAD OFFICE: 29, CLARGES ST., LONDON, W.1

Telephone: GROsvenor 6411 (10 lines)

TRANSFERS

OF SQUADRON CRESTS

for Aircraft, M.T., Notice Boards, etc.

The BRITISH TRANSFER PTG. Co. Ltd.

Tel.: COVENTRY 4021

AIRCRAFT FOR SALE

WSS

SHACKLETON, Ltd., 175, Piccadilly, London, W.1.

EUROPE'S leading aeroplane dealers (19 years at this address) offer this week a number of highly interesting aeroplanes.

OF particular interest is Mr. John Crammond's famous Hendy Heck. With this machine we will conduct

A Dutch Auction!

A Dutch Auction!!

WE will start by offering it at a reasonable price and will reduce this price £50 (Fifty Pounds) per week until it is sold or given away! Please note that a new engine has been fitted—a Gipsy Queen III, as used in the D.H. Rapide, and this engine alone is worth £350.

£650 P.ARNALL HENDY HECK. 3-seater cabin monoplane. New Certificate Airworthiness. Almost new Gipsy Queen III engine. A very attractive aeroplane for touring or racing. Don't wait too long for the price to go down!

£225 CESSNA C34, 4-seater high-wing cabin monoplane. Warner Super Scarab engine. Fitted lights, electric starter and generator. This machine has expired Certificate and is offered at this very low price strictly "as is" and "where is" as the owner is settling abroad.

£295 AUSTER ARROW. Continental 75-h.p. engine with starter and generator; new battery. Current Certificate Airworthiness. A post-war aeroplane in excellent order and under 200 hours since new. Built 1947.

??? PERCIVAL PROCTOR V, probably the best in the world. Certificate Airworthiness to February 1952, and only 300 hours since new on airframe and engine. Fitted long-range tanks, dual controls and 10-channel VHF receiver/transmitter. MF receiver, SBA, etc., etc.

W. S. SHACKLETON, Ltd., 175, Piccadilly, London, W.1. Tel. Regent 2448/9. Overseas Cables: "Shackhud, London." [0070

AIRCRAFT WANTED

R. K. DUNDAS, Ltd. We have a brisk demand from home and overseas; send us details of anything you have to offer, aircraft, engines, spares, etc., etc.—R. K. Dundas, Ltd., Aviation Division, 29, Bury St., London, W.1. Whitehall 2948. [0556

W. S. SHACKLETON, Ltd., Europe's biggest aeroplane dealers (19 years at this address) are always in need of new and used aeroplanes for re-sale. We will either buy your machine for cash, sell it for you on a modest commission basis, or take it in part exchange for another aeroplane.—W. S. Shackleton, Ltd., 175, Piccadilly, London, W.1. [0071

AIRCRAFT ACCESSORIES AND ENGINES

HOME and overseas aircraft operators, don't waste time and money unnecessarily. We need all British and American instruments, electrical accessories and ancillary equipment; first contract.

LTCO FLIGHT AIDS, Station Approach, Boxmoor, Herts. Tel. Boxmoor 1394. Grams, "Ltco Flight Aids, Boxmoor, Herts." [0613

AIRCRAFT bulbs, fuses, switches, instruments, radio parts and numerous other accessories, British and American.—Suplex Lamps, Ltd., 239, High Holborn, W.C.1. [0140A

A. J. WALTER, Gatwick Airport, Horley, Surrey. Large stocks of aircraft spares for Avro Anson, Auster, Argus, Beechcraft Traveller, Harvard, Piper Cub and many military types, including Spitfire and Mosquito.

COMPREHENSIVE range of engine spares for Continental (A-40 to C-125), Warner Super Scarab, Lycoming O-290, Rolls-Royce Merlin and Griffon, A.S. "Cheetah" range, etc. Also accessories for Pratt and Whitney 1830-92, R-985, etc. A.G.S. parts, lifting tackle, aircraft jacks, etc.

ALL available at reasonable prices.

INSTRUMENTS. Specialists in supply and overhaul of Sperry and Jack and Heintz control units and accessories. Let us quote you for overhaul or supply of all types of English and American instruments. Workshops A.R.B. and A.I.D. approved.

A. J. WALTER, Gatwick Airport, Horley, Surrey. Tel. Horley 1420 or Horley 1510 (Ext. 45). [0201

AIRCRAFT ACCESSORIES AND ENGINES WANTED

WANTED, aircraft Diesel motors, Junkers, Beardmore, Rolls-Royce, Packard, etc., any condition. State price and location.—Box No. 1194. [0252

WANTED, Quantities Anson I and Cheetah IX spares and instruments for export. Must be new, released or unreleased. Lists and firm quotes F.O.B.—Box 1266. [0073

AIRCRAFT SERVICING

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200.

AN approved design, maintenance and repair organisation staffed by experts on Miles aircraft. Major and Minor modifications a speciality; radio installations.

APPROVED instrument test shop; specialists in race preparations.

F. G. MILES, Ltd., Redhill Aerodrome, Surrey. Nutfield Ridge 2200. [0691

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge.—C. of A. overhauls, modifications and conversions. Tel. Byfleet 4?8. [0305

AIRCRAFT SERVICING

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel. Moulton 3381. [0307

WESTMINSTER AIRWAYS SERVICING, Ltd., contract maintenance and C. of A. overhauls of all types of aircraft at competitive rates.—Dakota specialists. —Blackbushe Airport, Camberley, Surrey. Tel. Yateley 3242. [0612

CARAVANS

WE hold the finest selection of caravans for home and holidays.

DISTRIBUTORS and Agents for Willerby, Winsome, Jubilee, Brush, Sunbeam, Eagle, Lanford, Marlow, Tudor, Premier, etc.

PRICES to suit all pockets. Easiest terms. Write, phone or call for full particulars. Open weekdays and Sundays.

X. L. CARAVANS Ltd., Blue Star Garage, Maidenhead, Berks. Tel. 2747. [0606

HOME or hire.—Let ex-Servicemen help the Services; give us your housing worries, or forget them on a holiday arranged by the Pathfinder Caravan Co., Ltd., Tedburn St. Mary, nr. Exeter. C.D.A.A. Member. [0578

CARAVANS. Berkeley range from £365 to £950 Glider Flyte, two- and four-berth, £212 and £940; Safari "4," £318. Towing hire purchase, accessories.—Particulars from Mantle's Garages, Ltd., Biggleswade. Tel. 2113. [0367

CARAVANS at lowest prices for Whitsuntide delivery. Choice of 30 models by famous makers from £306, all guaranteed. Long h.p. terms. Assistance with sites. Open 9 a.m. to 7 p.m. including Saturday and Sunday.—Stafford & Co., Caravan Specialists, Kirkheaton Bus Terminus, Huddersfield. Phone 4004. Members C.D.A.A. Buy where you are safe. [0242

CARAVAN hunting done with Huntingdon! Caravans built for the time of your life. Homes or holidays. Willerby, Raven, Berkeley, Eccles, Paladin, Car Cruiser, Northern, Sunbeam, etc. Sites near London and on the coast. Visit Francis Huntingdon Caravans, Ltd., Main Brighton Road, Coulsdon, Surrey. Uplands 5901. Open daily. [0705

CARAVAN towing service. 1/6 per mile towed, pick-up point to destination, modern saloons, includes 3-4 passengers, full insurance on passengers and tow; special rates for long distance and service personnel; let us quote; self-drive cars and caravans for hire; send for descriptive booklet: "Caravan Holidays the Osborne Way."—The Osborne Motor Co., Ltd., Osborne Road Garage, Southsea, Hants. Portsmouth 74218. [0703

A CARAVAN in a wet climate ! How much more careful you have to be in a climate like ours to get a leak-proof van! Even if the leak is mended, the wet inside may start rot. That's one reason why you should buy from ex-editor caravan paper living in van 13 years, with U.K.'s largest selection, a fleet of repair vans and a unique free-van-for-a-leaky-one guarantee. Better h.p. terms, too! (A.S.J. is also Secretary of the Caravan Residents Association, Member of the C.D.A.A., etc.) So, why not write for more and better brochures to head office : A. S. Jenkinson, Bath Road, Taplow, Bucks., Tel. Maidenhead 3434/5/6, or our Royal Selection London branch, A. S. Jenkinson, 80, Oxford Street (corner Rathbone Place) W.1. Langham 5606/7. Two min. from Tottenham Court Road tube station. [0639

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kit for sale, new and reconditioned.—Fisher's Service Outfitters, 89-93, Wellington St., Woolwich. Tel. Woolwich 1055. [0067

CLUBS

REDHILL FLYING CLUB.

LEARN to fly at Redhill Aerodrome, Surrey. South London's nearest flying centre, 23 miles from Hyde Park Corner. £3/10/- per hour dual; from £2/10/- solo; instrument flying, instructors' and advanced courses. Attractive clubhouse with full catering facilities. Tel. Nutfield Ridge 2245.

REDHILL FLYING CLUB. [0347

PROCTOR III club flying for £2/5/- per hour.—Full particulars from Vendair, Croydon Airport. Croydon 5777. [0005

HERTS & ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.C.A. approved 30-hour course; solo flying from 30/- hour; residential; trial lesson, 35/-; train from Liverpool St., or Green Line Coach 715.—Tel. Hoddesdon 2453, 2421, 3705. [0230

CONSULTANTS

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109, Jermyn St., London, S.W.1. Tel. Whitehall 8863. [0419

HOTELS AND ACCOMMODATION

ROYAL OAK HOTEL. Keswick-on-Derwentwater, heart of English Lake District, offers restful holiday to Air Force personnel; first-class accommodation at reasonable charges [0414

INSURANCE

ALL types of aircraft insurance and personal accident cover.—Apply to J. W. T. Amey, Messrs. R. J. Moffat and Co., Percy House, 796, High Rd., Tottenham, N.17. Tottenham 3003-4-5. [0584

PACKING AND SHIPPING

R. & J. PARKS, Ltd., 143/9, Fenchurch St., E.C.2. Tel. Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

RADIOS

TR. 1143 v.h.f. radio, in perfect condition, complete with crystals, £40.—Box 0945. [0900

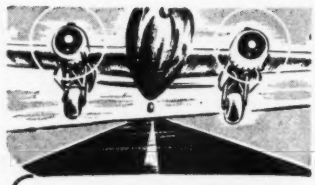
TIME RECORDERS

TIME recorders service rental. Tel. Hop. 2239. Time Recorder Supply and Maintenance Co., Ltd., 157-161, Borough High St., S.E.1. [5092

TUITION

GLIDING courses.

WEEKLY gliding courses for beginners from June to September. Full tuition to R.Ae.C. "B" certificate standard. Hotel accommodation, all meals, club membership and flying fees; inclusive charge, £12/12/-. Splendid opportunity to learn world's finest sport while enjoying country holiday. Spacious airfield in West Country, 650ft above sea-level.—Apply for full particulars and descriptive leaflet: Bristol Gliding Club, 55, Belvoir Rd., Bristol, 6. [0706



We're Entomologists

Specialists of the Tiger Moth.

The sun shone while our Managing Director was away, and the hay that we made is being brought to Gatwick in the form of Tiger Moths. The Gatwick Beacon never has had so many insects attracted to it before, in fact, it is beaconing these Tigers like Moths to a candle—oh!

We decided to become Tiger Moth Stockists, and as we learnt a long time ago, that it is no good doing things by half measures, we went out and bought three score and four of these carnivorous insects.

So if you want Tigers, or spares, you can feel fairly confident that AEROCONTACTS can supply your needs.

MILES GEMINI £1,500

C. of A. expiring on the 7th February, 1952.
930 hours on the Cirrus Minor II engines (1,000 hour life).
B.F. Panel STR/9 V.H.F. Radio.
500 watt, Engine Driven Generator.

MILES GEMINI £1,200

573 hours on engines (1,000 hour life).
B.F. Panel.
C. of A. expires on the 25th June, 1951.

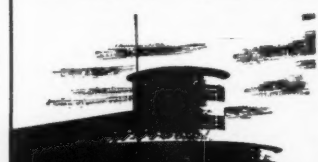
PROCTOR III £350

12 months C. of A.
475 hours on engines (750 hour life).

AUSTER MARK 5C £700

Gipsy Major IF engine.
674 hours since new.
Fully modified for racing.

The "AEROCONTACTALOGUE" is free, profusely illustrated and printed in three languages, on application from:



AEROCONTACTS Limited

GATWICK AIRPORT, HORLEY, SURREY

TELEPHONE HORLEY 1

TUITION

LONDON SCHOOL OF AIR NAVIGATION (1949), Ltd.

PERSONAL COACHING for Commercial, Instrument Rating, Senior Commercial, A.L.T.P. (conversion thereto) and Flight Navigator Licences. This School provides the most rapid and economical method of qualifying. I.C.A.O. standards. [0277

COMPLETE "STUDY-AS-YOU-WORK" courses. Simulates classroom instruction: Lesson, questions, model answers. Unique in application. Ideal those employed or seeking career from Services.

LINK INSTRUCTION AND R/T for all Instrument Rating procedures. Any form of flying training at best quotations. Brochure with terms: 8-10 King St., London, W.6. (Riv. 7400). [0277

DUAL and solo Austers M.C.A. approved. Weekdays, 41/6 week-ends, 51/6.—Elstree 3070. [0702

AERONAUTICAL engineering. Full-time practical and works training. Entrance by means of probationary term. Syllabus from the Secretary, College of Aeronautical and Automobile Engineering, Sydney St., Chelsea, S.W.3. Flaxman 0021. [0019

LEARN to fly for £24; instructors' licences and instrument flying for £3 an hour; night flying £3/10/- an hour; residence 4½ gns. weekly. Approved M.C.A. private pilot's licence course.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [0263

AIRCREW technical training for civil aviation pilot's and flight engineer's issues and endorsement licences. Day and evening courses for M.C.A. examinations.—College Secretary, College of Automobile and Aeronautical Engineering, Sydney St., Chelsea, S.W.3. Flaxman 0021. [0021

AIR SERVICE TRAINING facilities are unparalleled in the world of aeronautical education. Civilians and Service personnel of 60 different nations know we give the best instruction in flying, radio, navigation or aircraft engineering.—For particulars, write the Commandant, A.S.T., Hamble, Hants. [0329

A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass—no fee" terms; over 95% successes.—For details of exams. and courses in all branches of aeronautical work, navigation, mechanical eng., etc., write for 176-page handbook—free.—B.I.E.T. (Dept. 702D), 17 Stratford Place, London, W.1. [0707

SCHOOL OF NAVIGATION, University College, Wardsash, Southampton. — Flight navigator's course, £10/10/- for six months' tuition; pilot licences, £7/10/- to £13/10/- for six months' tuition; Link instruction; all approach systems, 10/- per hour or £3/10/- for ten hours; postal course; hall of residence.—Tel. Locks Heath 2161. [0057

MARSHALL'S FLYING SCHOOL OF CAMBRIDGE. M.C.C.A. approved courses (30 hours) for the private pilot's licence on Tiger Moth or Auster aircraft at £3 per hour; flying training for the commercial pilot's licence and instructor's endorsement; aircraft also available for aerial photography and air charter; for entrance fees or subscriptions.—The Airport, Cambridge. Tel. 56291 (Ext. 3). [0568

SOUTHEND MUNICIPAL FLYING SCHOOL. Phone Rochford 56304. M.C.A. approved for Private Pilot's Licence Course. Full training for Commercial pilot's Licence, including instrument and night flying. Instructors' Courses. Auster aircraft fitted with V.H.F./R/T. Dual, £3/5/- per hour; solo, £3 per hour. Contract rates dual, £2/5/- per hour; solo, £2 per hour. Night flying, dual, £4/5/- per hour: solo, £4 per hour. Link trainer, 10/- per hour.

LEARN to fly on the instalment plan, £12/10/- deposit and £1 per week for 15 weeks will get you solo. [0332

THE "ultra light." Solo flying on Dart Kitten and Slingsby Motor Tutor now available to licensed pilots at £1/10/- per hour.

SITUATIONS VACANT

CITY OF MANCHESTER.

MAINTENANCE engineer—Airports Department.

APPLICATIONS are invited from suitably qualified persons for the above post. The salary and conditions of service will be in accordance with Grade A.P.T. VI of the National Joint Council scales, i.e., £505, rising by £20 x £30 x £25 annually to £660 per annum.

DETAILS of the appointment and forms of application may be obtained from the Acting Airports Manager, Ringway Airport, Manchester, on receipt of a stamped, addressed envelope, and the application forms should be returned to the same address by May 13th, 1951. Canvassing is prohibited.

PREVIOUS applicants need not apply.

PHILIP B. DINGLE, Town Clerk, Town Hall, Manchester, 2. [0302

THE COLLEGE OF AERONAUTICS.

PROFESSORSHIP OF MATHEMATICS.

APPLICATIONS are invited for the newly-created post of professor of mathematics at The College of Aeronautics. The successful applicant will be responsible for the organised teaching of mathematics and he will be expected to assist and advise the departments of the College on problems of a mathematical nature that may arise in their teaching and research work. Preference will be given to applicants who have been actively engaged in some branch of aeronautics. For administrative purposes the professor of mathematics will be attached to the department of aerodynamics. The salary will be in the range of £1,420 to £1,600 per annum, depending upon qualifications and experience, with superannuation under F.S.S.U. and family allowance. If the successful applicant is married, a house at a nominal rental will be available for occupation. Applications, giving full details of qualifications and experience, and quoting the names of three referees should be addressed to the Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks., and the envelope endorsed "Professor of Mathematics." Further information may be obtained from the Registrar if required. Closing date for the receipt of applications is May 15th, 1951, and it is desirable that the appointment should commence not later than September 1st, 1951. [0245

SKILLED Fitters and Riggers required for overhaul work. Apply Box No. 1198. [0261

OLLEY AIR SERVICE have vacancies for first-class radio officers, Croydon Airport. Tel.: CROydon 5117. [0263

WESTERN SEASIDE CLUB requires maintenance engineer, Auster, Cirrus, Gipsy Major.—Box No. 1196. [0255

A LEADING aircraft manufacturing company in the South of England invite applications for the appointment of a senior design executive.—Box 1231. [0274

NAVIGATOR required for vertical photography. Some photographic experience desirable. Box 266, Aliardyce Palmer, Ltd., 109, Kingsway, London, W.C.2. [0251

FULLY experienced aircraft fitter-erectors and aircraft engine fitters required. Airwork General Trading Co., Ltd., Gatwick Airport, Horley, Surrey. [0229

SITUATIONS VACANT

THE COLLEGE OF AERONAUTICS

LECTURESHIP IN AERODYNAMICS.

APPLICATIONS are invited for the post of lecturer, or senior lecturer in aerodynamics at The College of Aeronautics. Preference will be given to applicants with specialised knowledge of the theory and practice of stability and control of high-speed aircraft, but applicants with other fields of interest will be considered. The successful applicant will be expected to direct students' research work and will be encouraged and given every facility to engage in research work of his own. The salary range for lecturers is £600 to £750 per annum and for senior lecturers £900 to £1,150 per annum, with family allowance and superannuation under F.S.S.U. If the successful candidate is married, it may be possible to offer tenancy of a small house. Applications, giving full details of qualifications and experience, and quoting the names of three referees should be addressed to the Registrar. The College of Aeronautics, Cranfield, Bletchley, Bucks., and the envelope endorsed "Lecturer in Aerodynamics." Further information may be obtained from the Registrar if required. Closing date for the receipt of applications is May 15th, 1951, and applicants should be prepared to take up their appointment not later than September 1st, 1951. [6244

COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF CIVIL AVIATION.

VACANCY for superintendent of airworthiness and aeronautical engineering.

SALARY: £1,638 to £1,894 (Australian currency) per ann., including cost of living and other adjustments.

DUTIES: Responsible to the Director of Air Navigation for the administration of the aeronautical engineering branch including the formulation of standards in respect of airworthiness of civil aircraft in current use and proposed new types and all equipment associated with aircraft; the approval of maintenance organisations and methods, and of manufacturing facilities for aircraft and equipment; the examination and licensing of maintenance personnel. Liaison with research organisations.

QUALIFICATIONS: Applicants, who should be graduates from a recognised university or have equivalent qualifications, should have had wide experience in the field of aeronautical engineering and be familiar with the development of modern aircraft and engines. A thorough knowledge of airworthiness requirements prescribed by the International Civil Aviation Organisation and authorities in the United Kingdom and U.S.A. and of the Australian Air Navigation Regulations is desirable. Applicants must have sound administrative ability.

FARES: Under specified conditions first-class boat fares (if first-class berths available) to Australia of the appointee and dependants (wife and dependent children) will be paid by the Commonwealth.

FURTHER particulars may be obtained from Australian Civil Aviation Liaison Officer, Australia House, London.

APPLICATIONS should be addressed to: The Civil Aviation Liaison Officer, Australia House, Strand, London, W.C.2, by May 17th, 1951. [6366

STRESSMEN of all grades are required by Saunders-Roe, Ltd. Interesting projects, with pleasant working conditions and staff assurance scheme.

TECHNICIANS interested should apply, stating qualifications, experience, age and salary expected, to Personnel Officer, Saunders-Roe, E. Cowes, I.W. [6237

DRAUGHTSMEN, senior and junior, urgently required for aircraft design. Aircraft experience desirable but not essential. Excellent prospects for first-class men.

APPLICATIONS in writing to the Personnel Officer, Hawker Aircraft, Ltd., Kingston-on-Thames. [6156

AIRCRAFT planning engineers and rate-fixers required. —Apply: Personnel Department, Vickers-Armstrongs, Ltd., South Marston, nr. Swindon, Wilts. [6171

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [6575

PILOTS required for contract work with a minimum of 1,000 hours on fighter-type aircraft.—Apply in writing, stating age and full details of experience, to Box 1067. [6193

WELL-KNOWN Middle East airline requires qualified pilots licensed for Consul and/or Rapide. Please give full particulars in writing only (no interviews at present).

(1) Pilot, senior commercial minimum with endorsement or passed technical on Ansons and/or Doves. Preference given to applicants with instructor or assistant instructor endorsement or A. and C. engineers' licences covering Ansons. Minimum salary: £1,200 plus full board for unmarried applicant; fully furnished accommodation for applicant accompanied by wife. Area: Persian Gulf. Contract three years. Charter and scheduled services. Excellent opportunity for right type for management, with bonuses for results. Interview in London in early May, ready travel middle May.

(2) Licensed operator/engineer required for Persian Gulf on charter and scheduled services. Emphasis to be placed on engineer abilities. W.O.M. type preferred. Conditions as above, with salary range according to qualifications.

WANTED, young single pilots, preferably with mechanical experience, for Israel. Commercial licence with 1,000 hours minimum and previous crop-spraying or carrier experience preferred. Please give full particulars in writing only (no interviews at present).

W. S. SHACKLETON, *Ltd.*, 178 Piccadilly, London, W.1. [6072

DRAUGHTSMEN, jig and tool and airframe, required by Aircraft Constructors, West of London Area. Limited accommodation available for single persons. Apply Box No. 1138. [6238

X-RAY crystallographer required for metallurgical research laboratory in West London area.—Apply, stating age, qualifications and experience, to Box 1072. [6219

COMMERCIAL pilot, preferably with instructor's endorsement, required for north country flying club. Would consider training suitable applicant for instructor's endorsement.—Box 1056. [6192

LICENSED radio engineer for maintenance of v.h.f., m.f. and a.s.v. components in Hythe aircraft. Good salary to right man.—Apply: Technical Manager, Aquila Airways, Hamble, Hants. [6166

AIRCRAFT stressmen required.—Write, stating qualifications and experience, to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6149

SHIPPING clerk required. Knowledge of import, export and customs documentation desirable. Good salary.—Full details to Box 264, Allardyce Palmer, Ltd., 109, Kingsway, London, W.C.2. [6172

THE HORSE'S MOUTH

(STRAIGHT FROM) IS HOW

WE MIGHT DESCRIBE THE

SORT OF EXPERT ADVICE

WE GIVE ON AIRCRAFT

CONSULT US BEFORE YOU BUY OR SELL

AIRWORK LIMITED

15 CHESTERFIELD ST., W.1. TEL. GRO. 4041

THE

DE HAVILLAND

ENGINE COMPANY LIMITED

have vacancies in their

DESIGN OFFICE at STAG LANE

for

SENIOR DESIGNERS & DRAUGHTSMEN

for work on Gas Turbine development and other projects

GOOD SALARIES & PROSPECTS

for suitable applicants

SUPERANNUATION SCHEME

Apply giving details of previous experience and salary to

THE PERSONNEL OFFICER

STAG LANE, EDGWARE,

MIDDLESEX

SITUATIONS VACANT

WANTED commercial licensed pilot with Auster and Rapide endorsements for short-term seasonal pleasure flying engagement.—Write: Pine's Airways, Ltd., Blackpool Airport. [6190

JIG and tool draughtsman required, fully experienced. Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [6260

HAWKER AIRCRAFT, Ltd., Kingston, require processengineers, jig and tool draughtsmen, planning and technical clerks. Generous salary, 5-day week, superannuation scheme. Applications to Personnel Officer. [6267

DRAUGHTSMEN, jig and tool and airframe required by aircraft constructors. West London Area. Limited accommodation available for single persons.—Apply Box No. 1195. [6263

AIRCRAFT STRESSMEN required. Write, stating qualifications and experience to Employment Manager of Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [6243

CHIEF GROUND INSTRUCTOR required for an R.A.F. flying school in the Home Counties.—Write giving full details of experience and qualifications and salary required to Box No. 1193. [6248

AIR SCHOOLS, Ltd., Derby Airport, have vacancies for pilots with Oxford aircraft experience (commercial licence not necessary), ground instructors for lecture purposes, and aircraft engineers for Ansons, Oxfords, Chipmunks and Tiger Moths.

APPLY first instance, in writing, stating age, experience, etc., to The Secretary, Air Schools, Ltd., Derby Airport. [6236

DRAUGHTSMEN with good aeronautical (or mechanical) experience, and stressmen with aeronautical experience required for varied, interesting work.—Portsmouth Aviation Developments, The Airport, Portsmouth. [6602

JIG and tool draughtsmen. Seniors and juniors required by aircraft manufacturers on south coast.—Write, stating age, full details of experience and salary expected, to Personnel Officer, Saunders-Roe, Ltd., East Cowes, I.o.W. [6207

GLOSTER AIRCRAFT Co., Ltd., have a vacancy for a fully experienced aircraft structural and electrical draughtsman. Applications in writing, stating age, experience and salary required, to: Employment Officer, G.A.C., Ltd., Hucclecote, Glos. [6262

CHIEF FLYING INSTRUCTOR required immediately by Midland Aero Club, Birmingham.—Commercial licence endorsed for Auster and Tiger Moth aircraft, instructor's rating and C.F.S. category necessary for A.T.C. commitments. [6240

GRAVINER, Colnbrook, has vacancy for assistant chief inspector.—Applicants with wide experience in machine shop procedure and assembly of small parts should write to Chief Engineer, Poyle Mill Works, Colnbrook, Bucks.

AERONAUTICAL RADIO SERVICES, Ltd., have vacancy for aircraft radio maintenance engineer (licensed). A responsible position for the right man. Good salary and excellent prospects.—Applications to Blackbushe Airport, Camberley, Surrey. [6222

AIRCRAFT radio and radar mechanics required at Southend Airport. Bench and installation experience preferred. Rates 3/- to 3/2 per hour, 44-hour week.—Apply: Aviation Traders, Ltd., Municipal Airport, Southend-on-Sea, by letter. [6805

PROFESSIONAL ASSISTANCE required by leading correspondence college for the preparation of a course of study for aircraft Maintenance Engineers' licence "M," category "B."; apply by letter, giving full details of experience and qualifications to Box No. 1154. [6261

SENIOR and intermediate aerodynamists required for work on interesting new projects. Candidates should possess engineering degree or equivalent qualification, and have experience of modern high-speed aerodynamics. Pleasant working conditions, staff assurance scheme, etc.

APPLY, stating age, experience and salary expected to Personnel Officer, Saunders-Roe, Ltd., E. Cowes, I.o.W. [6236

THE DE HAVILLAND AIRCRAFT Co., Hatfield, invite applications from male clerks for compilation of printing office schedules and spare parts catalogues. Ability to read drawings essential. Ex-R.A.F. or Fleet Air Arm personnel with maintenance experience might be suitable.

APPOINTMENTS will be made under weekly staff conditions. Hours 8.45 to 5.30 on a 5-day week basis.—Apply in writing giving details of age and previous experience, to Personnel Manager. [6146

DRAUGHTSMEN, Senior and Junior, jig and tool required for work on interesting and varied projects. Pension Scheme. Full details of experience, etc., to The Personnel Manager, Fairey Aviation Co., Ltd., Hayes, Middx., quoting reference DO/Ai. [6254

SENIOR planning engineers and rate-fixer/estimators required for quantity production planning of gas-turbine engine. Excellent working conditions and an interesting programme of work, with good prospects for applicants having the requisite experience.—Apply in confidence to Box 0943. [6162

ENERGETIC representative required for spares and sales department of aircraft service organisation. Must be experienced and have good contacts in the trade both home and overseas. Location South London. Applicants must give details of previous employment, age, and salary required, etc., to Box No. 1210. [6264

DOWTY EQUIPMENT, Ltd., Aircraft Hydraulic Engineers, Arle Court, Cheltenham, require design draughtsmen, preferably with some knowledge of hydraulic and landing gear components for aircraft.—Write: Personnel Manager, giving details of training and experience, and mentioning age and salary range. [6902

TEST engineer required for development work on aircraft hydraulic systems. Previous experience desirable, but not essential. Age 18-30.—Apply, in writing, stating age, experience and salary required to Mr. T. F. Sewell, Chief Test Engineer, British Messier, Ltd., Cheltenham Road East, Gloucester. [6269

URGENTLY required, the following aircrew: two captains, two 1st officers, two radio operators with endorsements on Bristol freighter and York aircraft.—Send full particulars of qualifications, etc., to Surrey Flying Services, Ltd., 78, Buckingham Gate, London, S.W.1.

FIELD AIRCRAFT SERVICES, Ltd., of Croydon Airport, invite applications to the appointment of buyer. Experienced candidates, who must be keen negotiators with a real knowledge of market conditions and resources, with particular emphasis on American aircraft and engines, should apply by letter only to the Personnel Officer, giving full details of career and salary required. [6272

FIELD AIRCRAFT SERVICES, Ltd., Engine Overhaul Division, Croydon. Applications are invited for the position of production engineer to be responsible for the overall control of planning progress and stores departments of this division which is engaged on a programme of complete overhaul, repair and modification of all types British and American engines. Salary commensurate with experience and qualifications. [6273

ROLLASON'S ENGINES LTD.

CROYDON AIRPORT
Tel.: CRO 5151/4—Cable, ROLLAIR CROYDON

Stockists of:

D H GIPSY MAJOR	CHEETAH IX & X
D H GIPSY QUEEN II	P & W R.985 - 1340
D H GIPSY QUEEN III	P & W 1830/43 - 1830/92

ENGINE HOURS FROM NIL SINCE NEW OR COMPLETE OVERHAUL

SITUATIONS VACANT

THE DE HAVILLAND AIRCRAFT Co., Ltd., have vacancies for senior design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.—Applications, stating age, experience and salary required, to Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [5919

SENIOR TECHNICAL ASSISTANTS required for aero engine stress office. Knowledge of reciprocating and gas turbine engine desirable, B.Sc. or equivalent preferred. Write, giving age, full details of previous experience and salary required, to The Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [6241

SCOTTISH AIRLINES require first officers at once. Dakota experience an advantage. Superannuation scheme in operation. In special cases pilots will receive assistance in obtaining flying portion of licences.—Write, stating full details of licences and experience, to Personnel Manager, Scottish Airlines, Prestwick Airport, Ayrshire. [6194

THE DE HAVILLAND AIRCRAFT Co., Ltd., have vacancies for senior design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.—Applications, stating age, experience and salary required, to Chief Draughtsman, The de Havilland Aircraft Co., Ltd., Hatfield, Herts. [6271

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows—Designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [6420

HANDLEY PAGE, Ltd., require an electrical technician, preferably with H.N.C. (Elect.) and with a knowledge of electronics, for work in connection with the development of aircraft electrical circuits and installations.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6196

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design desirable but not essential.—Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [6446

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for stressmen who should have at least two years' experience and with qualifications up to A.F.R.Ae.S. or its standard; these vacancies carry excellent prospects for the right men. Send full particulars to the Personnel Officer, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading. [6074

CHARTERED ELECTRICAL ENGINEER. A vacancy exists for an electrical engineer, capable of undertaking installation and technical design work on high voltage AC and DC aircraft systems. Applicants should possess technical initiative and be fully conversant with aircraft practice. This permanent post is one with prospects for a suitable candidate. Apply to Personnel Officer, Saunders-Roe, Ltd., E. Cowes, I.o.W. [6256

SENIOR and JUNIOR DRAUGHTSMEN required for interesting work on aircraft air-conditioning and pressurization equipment. Light mechanical experience desirable, scope for keen, capable men in expanding firm. Drawing office checker and weight estimator also required. Write, stating age, experience, etc., to The Personnel Officer, Sir George Godfrey & Partners, Ltd., Hampton Road, Teddington, Middlesex. [6230

BRITISH EUROPEAN AIRWAYS have vacancies for radio officers. Applicants must possess a current Ministry of Civil Aviation first-class radio telegraphy operator's licence and have operated as an aircraft radio officer during the last 12 months. Grade on entry will be radio officer category "B," at a commencing salary of £550 per annum. Requests for application forms should be sent by postcard to Personnel Officer, Flight Operations Department, B.E.A., Keyline House, Ruislip, Middlesex. [6246

DRAUGHTSMEN and stressmen required by well-known firm in the Midlands for interesting design and development work on rocket propulsion and airframes. Previous experience in this field is not essential. The positions offer good prospects to keen men.—Applications, giving age and qualifications, are invited from men with good mechanical, electrical or aircraft experience. Box 1101. [6230

REQUIRED for aircraft engineering development laboratory. The Bristol Aeroplane Co., Ltd., have vacancies for test assistants for general duties in connection with structural and mechanical testing, design of test rigs, test analysis, etc. Higher National Certificate and experience in this class of work desirable.—Applications to the Personnel Manager (Aircraft Division), Filton House, Bristol. [6215

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential.—Apply Chief Engineer, Eagle Aviation Ltd., Luton Airport, Luton, Beds. [6610

AIRCRAFT draughtsman required.—Apply, stating experience, age and salary required, to the Chief Draughtsman, Alan Munts and Co., Ltd., (Aircraft Section), Heston Airport, Hounslow, Middlesex. [6275

PLANNING engineers for gas turbine component manufacture required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme.—Apply, giving details of previous experience and salary required, to Box 1252. [6577

PLANNING engineers for gas turbine assembly and test required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme.—Apply, giving details of previous experience and salary required, to Box 1253. [6578

DRAUGHTSMEN with experience in the design of automobile or aircraft accessories or of hydraulic equipment are required by progressive Midland manufacturing company. The positions are permanent and offer special attractions to younger men. Salaries in excess of usual scales will be paid to those possessing good experience and qualifications. State full details of training and experience, age and salary required.—Box 0664. [6177

HANDLEY PAGE, Ltd., have vacancies for senior and junior technical assistants in the mechanical and structural test department at Radlett or Cricklewood. Qualifications should include a degree or Higher National Certificate. Previous experience is desirable but not essential. Write, stating age, qualifications and details of experience to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6089

STRESS or mechanical test engineers are required for the Aircraft Division of the English Electric Co., Ltd., at Warton Aerodrome, near Blackpool. These are interesting vacancies on new projects, offering good prospects to suitably qualified engineers experienced in either of these fields. Write, giving full information, mentioning ref. 434A, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [6193

VACANCIES exist in a high-class engineering establishment for men between 21 and 30. Duties involve analysis of experimental engine test results and performance work in connection with development of high-speed I.C. engines. Qualifications, trade apprenticeship and H.N.C. Experience of similar work an advantage. Good canteen, sports facilities and 39½-hour week. Write, stating age, experience, qualifications and salary, quoting ref. DEE to Box No. 1197. [6260

ELECTRICAL DRAUGHTSMAN, familiar with light mechanical or instruments and preferably with some circuit experience, required by Dowty Equipment, Ltd., Arle Court, Cheltenham, for their electrical development department. Age 21-25. Higher National Certificate preferred. The factory is ideally situated in the grounds of a country house and working conditions are excellent. Write to Personnel Manager, stating age, experience and salary required. [6259

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for senior and junior draughtsmen with aircraft experience. Also required are stressmen, who should have at least two years' experience and with a degree or Higher National Certificate with endorsements in aeronautics. These positions are progressive and offer excellent opportunities to the right men. Please send full particulars to the Personnel Office, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading. [6001

BRITISH OVERSEAS AIRWAYS Corporation offer opportunities of work on modern airliners to the following tradesmen: electricians, instrument mechanics and radio mechanics, sheet metal workers, engine and airframe fitters experienced in the maintenance or overhaul of aircraft and/or components. Rates of pay, 2/9 per hour, plus 4½d. per hour provisional bonus. Attracting proficiency pay up to 3d. per hour; five-day, 44-hour week; possible shift work. Good pension, sick pay and holiday facilities. Write to Staff Manager, Hut 29, London Airport, Feltham, Middlesex. [6800

AIRWORK, Ltd., urgently require: In the north of England, navigation instructors who should be in possession of, or in a position to obtain, a flight navigator's certificate and preferably with R.A.F. staff navigator experience. A link trainer instructor who must have previous R.A.F. instructing experience. In the Home Counties and north of England: flying instructors with R.A.F. *ab initio* instructing experience and a minimum B1 category.—Write, giving full particulars, to Airwork, Ltd., Sutton Lane, Langley, Bucks. Envelopes to be marked "Flying Training." [6249

HIS MAJESTY'S COLONIAL SERVICE.

GOLD COAST.

A VACANCY exists for an assistant meteorologist in the Gold Coast. The post is permanent and pensionable and the salary according to qualifications and experience, in the scale £510 (for three years) to £825, plus pensionable expatriation allowance of between £150 and £250 a year. Temporary non-pensionable cost of living allowance also payable. Where Government quarters are provided, rental of between £60 and £90 is deducted according to salary. Free first-class passages are provided for the officer and, subject to the Governor's permission, his wife, once each way each tour. Free passages are granted for up to three children under nine years of age, in each tour, provided they reside in the Gold Coast for at least six months. Income tax at local rates which are very much lower than in United Kingdom. Tour of service is eighteen months, and leave on full salary is granted at the rate of seven days for each month of resident service. Candidates, who should have completed or have been exempted from National Service, must possess Higher School Certificate or its equivalent in Mathematics and Physics, preferably with experience of forecasting for aviation. Duties are primarily forecasting, but may include other technical meteorological duties. Candidates should write, giving brief details of age, qualifications and experience, to the Director of Recruitment (Colonial Service), Sanctuary Buildings, Great Smith Street, S.W.1, quoting the reference 27118/5/50. [6277

THE BRISTOL AEROPLANE Co., Ltd., require supersonic aerodynamicists for interesting work. Excellent prospects for advancement.—Applications in writing to the Personnel Manager, Aircraft Division, Filton, Bristol. [6276

FACTORY layout and handling equipment design engineers required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme.—Apply, giving details of previous experience and salary required, to Box No. 1249. [6447

MECHANICAL draughtsmen for equipment design required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme. —Apply, giving details of previous experience and salary required, to Box 1250. [6440

PLANNING engineers with experience of manipulation and welding of stainless steel required. Good salaries and prospects for suitable applicants. 5-day 39-hour week. Superannuation scheme.—Apply, giving details of previous experience and salary required, to Box 1251. [6576

BRITISH EUROPEAN AIRWAYS have vacancies for pilots with the minimum qualification of a current commercial pilot's licence: (*a*) Pilots, aged 34 years and under, who will be engaged under the normal conditions of service, which includes membership of the pension scheme. Commencing salary on engagement will be within the range £600-£750 p.a., according to qualifications and experience; (*b*) Pilots, aged 35 years and over, who will be engaged under special conditions on a temporary appointment for a period of service of two years with the possibility of extension. Commencing salary on engagement will be within the range £600-£900 p.a., according to qualifications and experience. Pilots serving on these appointments will not be eligible for entry into the pension scheme, but will receive a gratuity of £300 on the termination of the appointment for each completed year of service, subject to completing at least one full year's service. Requests for application forms, stating whether (*a*) or (*b*) appointments are being applied for, to be made by postcard to the Personnel Officer, Flight Operations Department, B.E.A., Keyline House, Ruislip, Middlesex. [6247

WANTED

STEEL, aluminium, brass. Sheets, strip, bars, off-cuts. Any quantity. Immediate payment.

GRADES SHEARED METAL Co., Ltd., Green Lane, Hounslow, Middx. Tel. Feltham 3274. [6161

STEEL hangars pref. Pentad req'd immed. Incomplete structures considered.—Box 0955. [6178

BRIGHT M.S. strip or offcuts, 0.018—0.024, any width.—Jarvis, 1 Silvermere Avenue, Romford. Tel. 1397. [6270

ALL types of flying jackets, helmets, boots and outer flying clothing, either singly or in bulk.—Write: Box 556, c/o Geo. Murray (Advts.), Ltd., 184, Strand, W.C.2 [6276

BOOKS, ETC.

BOUND *Flights*. Early edition as well.—G. Dietrich, 6, Pollocks Cottages, Fagys Rd., Hatton, Feltham, Middx. [6167

Jubilee PATENTED WORM DRIVE CLIP
the finest **CLIP** *in the world*

L. ROBINSON & CO. (GILLINGHAM) LTD.
Gillingham Kent

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. Flight can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd., Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

B·O·A·C Specifies

The de Havilland Comets which will shortly be flying in the service of the British Overseas Airways Corporation will be equipped with the Sperry Zero Reader. This great advance in the simplification of instrument flight has a special appeal to airlines whose reputation relies on punctual and reliable operation even under adverse weather conditions.

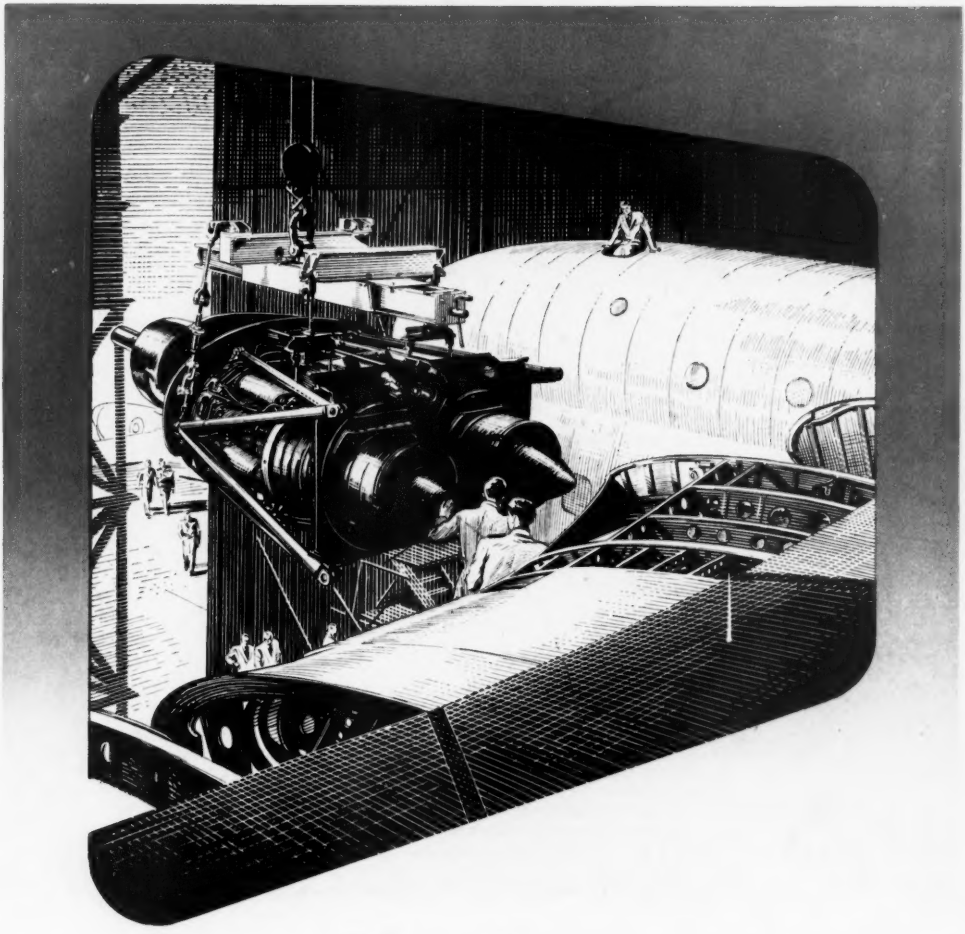
The Zero Reader is an automatic flight indicator which electronically combines attitude, heading, altitude and radio information on a single indicator. The co-ordinated information is presented on a vertical and horizontal needle indicating to the pilot control movements required to achieve a selected flight plan.

- **It eliminates the fatigue and lost time of mental co-ordination of flight instrument readings.**
- **It simplifies the pilot's operations during the vital period of approach.**
- **It makes possible the introduction of reduced minimums with a consequent decrease in overall operating costs.**
- **All flying from take-off to landing is done by reference to the Zero Reader indicator; thus there is no change-over to a different form of presentation during the critical portion of the flight, the final approach.**

The
SPERRY
ZERO READER
Master Flight Instrument

SPERRY

THE SPERRY GYROSCOPE CO. LTD., GREAT WEST ROAD, BRENTFORD, MIDDLESEX · EALing 6771



INSTALLING *Bristol* PROTEUS ENGINES

IN A SAUNDERS-ROE *Princess*

LONG RANGE FLYING BOAT

SAUNDERS-ROE LIMITED OSBORNE EAST COWES ISLE OF WIGHT
THE BRISTOL AEROPLANE COMPANY LIMITED · ENGLAND